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Electrical World

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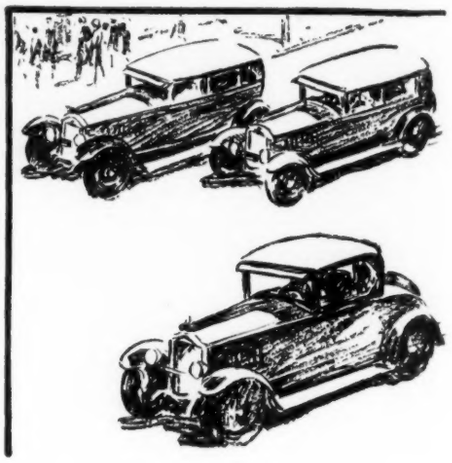

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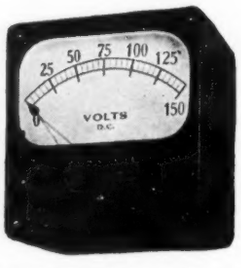

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Transmission Line Data

A TABULATION of detailed data on 877 transmission lines will be issued as a supplement to the ELECTRICAL WORLD issue of September 14. Consisting of about 25,000 separate items, it will constitute a comprehensive survey of practice in high-tension construction in all parts of the United States.

Nearly a year's time has been required for the collecting and compiling of this mass of data, which, if published in page form, would require the equivalent of nearly two entire issues of ELECTRICAL WORLD.

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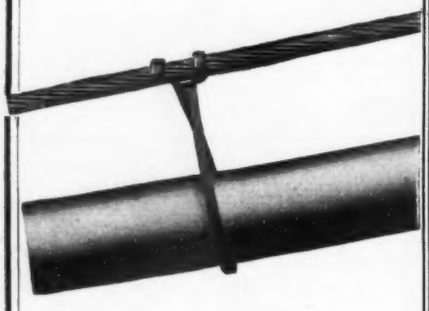
Meeting new developments with aerial power cables...



TELEPHONE cables on poles are a familiar sight to all. It is just as easy to install aerial power cables.

This practice is a modern development and is increasing because aerial power cables afford such simple means of adding capacity to transmission lines; of repairing open wire circuits without shutting down a whole line; and of relieving crowded pole tops.

Aerial power cables are often the best means of taking on heavy power loads; of bridging gaps in system expansion; and of postponing underground or other impending changes.

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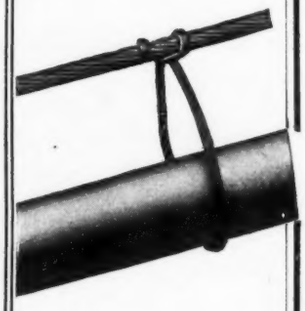

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Electrical World

A McGRAW-HILL PUBLICATION—ESTABLISHED 1874

L. W. W. MORROW, *Editor*

VOLUME 94 — *New York, Saturday, September 7, 1929* — NUMBER 10

Governor Roosevelt Celebrates a Holiday

EVER a kindly and generous man, Governor Roosevelt of New York has won the admiration of his fellow-citizens no less by his personality than by his political astuteness. It may even be said he has the courage of Don Quixote. Last Thursday, it being state fair time in Syracuse, he took a day off from the cares of office and mingled with the rural populace. In a remarkable speech his benign disposition showed itself to perfection, for the thought that "today nearly two-thirds of all the farmhouses in the State of New York have no electricity" led to the observation that families in one section are grossly penalized as compared with families in another section. The telephone company was bad enough, he averred, but "the other example, and one which is even more glaring in its unfairness, is that of the use of electricity in the homes. The railroad principle of fairly uniform rates has been thrown to the winds even by the public regulating body known as the Public Service Commission." The Governor contended that of course the farmer—every farmer—should have telephone and electric service, for cannot every one ride on the railroad, and at the same cost per mile, no matter where he or the railroad may be located?

Now, holidays are excellent things and largess from one's Governor is another, but there is neither sweet reasonableness nor much more than idle words in such generosity. It is hardly necessary to point out that railroads do not build branch lines to every rural community and that no pretense of comparable service on branch and main lines is offered by them. There may be—and it would be absurd to make a blanket denial—injustices in rate structures, but if every rural home is to have electric service at the same rate that the citizen of a densely populated area enjoys, there is rank injustice for hundreds of city dwellers as against that for one farmer. The jubilant executive forgot for a moment the principle of "the greatest good for the greatest number."

After all, there is no deep-laid plot on the part of the utility companies to deprive the farmer of electric service, or to rob him. On the contrary, rural electrification is a basic utility program; but it is not something that can be accomplished overnight, although it is proceeding rapidly, and one may suspect that the Governor in the seclusion of his study may be less sentimental than when mingling with his constituents.

It may be that he knows that the mergers recently consummated in his State will make possible the carrying out in a businesslike way of a utility program that seeks to give electric service to every home under the most favorable cost conditions. He might grant that the holding company is a necessary business agency in attaining the maximum degree of rate uniformity in a region.

Any man is, in principle at least, entitled to his own opinion, and the learned Mr. Roosevelt may have been quite sincere and purposeful about his little holiday speech. On the other hand, he may have been enjoying one of those upstate fall mornings that are so sparkling and invigorating that idealism for the moment carries one away in a flooding rush with the exuberance of nature itself. Holidays are—holidays.

* * * *

The States Should Speak

PUBLIC service commissioners, while not overalarmed at the prospects of the enactment of Senate bill No. 6 and its amendments, generally known as the Couzens bill, nevertheless decided at their convention last week to safeguard their present powers from federal usurpation. By unanimous resolution the National Association of Railroad and Utilities Commissioners opposed the creating of any new federal agencies interfering with the regulatory powers of the states in fields where the states are now adequately functioning. Some of the more radical members charged that the attitude of the federal courts has nullified the powers of the state commissions and that there is danger in the creation of great holding companies for utility industrial and banking groups. Indeed, it is safe to assume that many of the commissioners are not averse to federal regulation of holding companies and of investment trusts. More conservative commissioners place the blame for the present move at the doors of senators like Norris and Walsh of Montana, who fancy that national legislation is a great panacea and who do not stand on ceremony in introducing legislation inimical to the rights of the states.

Unfortunately, however, mere resolutions, however well intended, make little impression on Congress, and it will be necessary for the commissioners to show more determination and "fight" if their wishes are to prevail. Now is as propitious a time as any to throw down the gauntlet to Congress over the regulatory rights of the

states and to resist further federal encroachments, and if the state commissions will arouse the legislatures and governors of their states, and particularly the electorate, to the threatened danger so that the commissions will not stand alone in their opposition, the attempt of Senator Couzens to thrust the federal government into the field of regulation now occupied by the states will come to naught. The states cannot depend on others to fight their battles for them. This is purely a state matter, and if the states will but voice their opposition audibly and uncompromisingly, Congress is sure to hear and to heed.

* * * *

New Business Gone Astray

IF AN industry has settled in any place and wants information on the rates for purchased power, it usually experiences little difficulty in getting the answer from the local utility company. But when an organization is decentralizing and has not determined where it will establish new plants difficulties are experienced which have provoked some industrial men to exclaim: "If it is going to be so hard to obtain rates in different territories, we shall be tempted to install our own generating equipment."

Just recently the attorney for a large steel concern, which is considering the installation of a new plant, went through the same experience that several other industrial organizations have had. His client had not selected any particular location, nor had it even limited the sites to a few places. Instead, to this attorney had been given the task of determining the relative advantages of all possible sites in the United States and Canada, and power rates constituted one of the factors which were to be considered. He tried N.E.L.A. headquarters, but reported that all he could obtain were reasons why rates differ and why no specific information could be given him. When he reached the ELECTRICAL WORLD he was in a frame of mind that led him to declare himself tempted to recommend a private generating plant.

Now, all know that the seekers of such information are largely themselves at fault for not readily getting the answer they want; but with an era of decentralization of industry just getting under way, is it not to the advantage of utilities to overlook the random way in which industries seek a definite answer on power rates and make it easier for them to obtain information? When could it be easier to add another large customer to the fold of purchased power than when such a potential buyer of energy is considering building a new plant?

It is, of course, recognized that rates depend on where the plant is located, how near it is to service facilities that need not be altered to handle the load, whether primary or secondary service is used, what the magnitude of the load will be, how high the power factor and load factor are, and so on. But it would help such industries if blanks could be furnished the N.E.L.A. or some other clearing house on which the prospective customer's requirements could be listed and sent to various utilities so that they could give an estimate of the rate that could be offered. Such information would give the basis at least on which the industry could conduct a more detailed survey. The principal thing is to make it easy for industries to formulate their decentralization plans.

* * * *

Organizing for Effectiveness of Distribution Crews

THE distribution department has undoubtedly been affected as much as any other branch of power-company activity by the growth of systems and their divisions. This evolving situation has disturbed the size of crews and trucks and also the radius of operations from bases. It is no simple matter to meet all the requirements of size and radius of action of the crews when one adds to the above the fact that the tasks imposed on the gangs are greater in variety and magnitude than ever.

There are many systems today where centralization and consolidation might easily result in an organization in which the task of building a half mile of primary extension in some hamlet would result in sending the standard line gang of eight or ten men from the line department base, 80 or even 100 miles away. It is unthinkable that this extreme could actually be discovered in operation, but it is to be feared that there are many actual cases nearly as unjustifiable.

Large line crews are often appropriately used for jobs of extended magnitude, but the size and the travel from base can be drastically cut for the simpler tasks of short extensions, customer service and moving poles for highway improvements and to clear garage entrances. One could almost say that the size of the gang would match the value of customer density as it thins out from metropolis to village. But the rule is only ventured for the sake of focusing attention on one of the most distressing growing pains of our big industry.

Those in charge of crew assignment will find better rules as they discover ways of multiplying bases, dividing the big gangs and adding a more methodical scheduling of tasks. Contentment of the gangs when working nearer their homes, cost of boarding the men away from home, type of labor attracted to the job, which incidentally would progress toward stable year-round employment, are just a few of the components of saving and improvement within reach.

* * * *

Ionization Prevention and Better Cables

BASED upon the contention that the removal of entrapped air from the dielectrics of cables and condensers is virtually impossible and that the way to avoid insulation breakdown is to prevent ionization, an interesting research has been undertaken by Messrs. Brown and Sporing of England. Their conclusions indicate that if the dielectric contains air it is not possible

to prevent ionization by increasing the dielectric thickness unless this is carried to a prohibitive extent, so that the absolute potential rather than the potential gradient should be the deciding factor. The principle established for a design basis is that ionization of entrapped air is impossible unless the voltage applied to the electrodes exceeds the minimum sparking potential, which in air at atmospheric pressure is about 300 volts. The indicated method is therefore to have the dielectric arranged to consist of such a number of sections in series that the voltage across any one section shall not exceed that required for ionization.

The limiting thickness which may be used for one section will be determined by the puncturing voltage of the thin layers. The permissible potential gradient will increase indefinitely as the thickness of the dielectric decreases, the voltage remaining constant at 300. Thus the final thickness will be a compromise and will be such as to give a reasonable factor of safety in regard to puncture tests. The extension of this principle to cable manufacture requires the dielectric to be divided up into a large number of sections of equal capacity by means of layers of metal foil, or preferably by paper coated with a semi-conducting film; then by adjusting the number of sections the voltage applied to each can be kept below the ionization potential.

Cables are, when operating and installation factors are considered, almost marvelously satisfactory, but, from the viewpoint of absolute results and the criterion of the desirable, fall far short of what might be secured. Knowledge and imagination, patient research and courageous experimentation are needed if the slow advance in the art is to be in any great measure accelerated. Any inspiration for improvement needs but to prove its worth in practice to be welcomed jubilantly.

* * * *

The Franklin Specification for Illumination Intensities

WHEN the temperature in a room is about 70 deg. F. the scientist with a very accurate thermometer and the ignoramus who does not know what a degree Fahrenheit is will agree that the temperature is just right. They will agree also that 90 degrees is too hot and that 50 degrees is too cold. The laws governing temperatures in apartments and street cars are also quite definite, giving minimum required temperatures only, and there are no authorities who make such vague recommendations for definite cases as from 25 to 100 degrees.

Not so with light. Even experts among themselves will not agree on certain intensities as being just right or too bright or too dark. Without the use of a meter they will find it quite difficult to estimate the intensity, especially when the light is a little red or a little blue. On a recent occasion a number of very excellent illuminating engineers estmated the intensity of a certain room variously from 6 to 16 foot-candles, the actual intensity showing on the meter as $2\frac{3}{4}$ foot-candles and the reason for the wrong estimates being the fact that the room was illuminated by ivory-coated lamps.

Considering all this, it would seem that the Franklin specification for lighting intensities is as good as could be expected, it being of necessity a compromise between the vague opinions of a number of experts. However, it would seem preferable for such a specification to restrict itself to minimum requirements and to give no further recommendations, and on minimum requirements experts will have less difficulty to come to an agreement. But how is the public expected to respect a specification which, for instance, in a definite case specifies a minimum of 10 foot-candles and then goes on recommending 25 to 100 foot-candles for the same case? To the experienced illuminating engineer such a recommendation is intelligible; but the experienced illuminating engineer does not need such a recommendation, and the general public does not know how to apply it. So why have it at all? There should be a code giving minimum intensities only. The public could be easily educated to respect such a code, and legislators could be eventually induced to make it the law of the land if this should be advisable.

* * * *

Use of New Material Often Saves Money

SCRUTINY of field expense sheets in electrical construction jobs reveals the importance of keeping a sharp watch over the relative cost of labor and material in seeking minimum capital outlays. During a discussion of this matter recently in the office of a prominent consulting engineer, the point was repeatedly stressed that the price of skilled labor is now at levels where the purchase of finished material and indeed of much new equipment is far more economical than attempting to prepare odd lots of material or to rebuild old apparatus on hand for standard construction purposes.

In the wiring examples reviewed it was stated that the time required to make joints which were not needed when new copper was available in ample coils or reels ran the expense out of line with economical practice. Piecing together long and short runs of wire from company stockrooms, no matter how good the condition of the material, delayed the con.pletion of field work besides incurring a per-hour rate undesirable in itself as an excess charge. It is needless to multiply illustrations of the time-saving value of what might be called full-size standard material and fittings to engineers responsible for the rapid execution of construction and maintenance jobs. Numerous supplies stocked in units of continuing usefulness do not fall in the category of odds and ends, but there is a tendency among not a few plant executives and contractors in both industrial and utility fields to try to utilize material which cannot be installed without undue labor cost, simply because it may be on hand in excellent physical condition and quickly delivered by truck to points in the field. A more critical judgment will produce real dividends in time and labor saved.

Beauty in Business

The Stepped Ceiling Panels of This Display Room Are Finished in Gold, Which Warmly Reflects the Indirect Lighting

The Basement Bungalow Is a Feature of This Store

CENTRAL stations have come to an appreciation of beauty as a business adjunct. Nowhere is this appreciation more apparent than in the quarters designed for contacts with customers and for the display of electrical merchandise. Each new store or office that is opened seems to have gained cumulative merit.

If a Customer Must Wait While Records Are Consulted, He May Sit in This Pleasant Room and Write a Letter if He Chooses

Photos Courtesy of Public Service Company of Northern Illinois

Economy in Using
Conduit as Return Conductor*

Building wiring costs could be cut $3,600,000 a year. Details of proposed new scheme of wiring

By EDWARD BENNETT
Professor of Electrical Engineering, University of Wisconsin

THE general practice in the wiring of fireproof buildings is to place all the branch lighting circuits in ½-in. or ¾-in. steel conduits which extend from the metal boxes inclosing the switches and fuses of the distributing panels to the metal switch boxes and metal outlet boxes in the various rooms and halls. In general, the branch lighting or appliance circuit contained in any steel conduit is a two-wire, 110-volt circuit, the wire being either No. 14 or No. 12 B & S gage rubber-covered. The lighting system in the building is a three-wire direct-current or alternating-current system having 110 volts between each outside wire and the neutral wire and 220 volts between outside wires. The National Electrical Code requires:

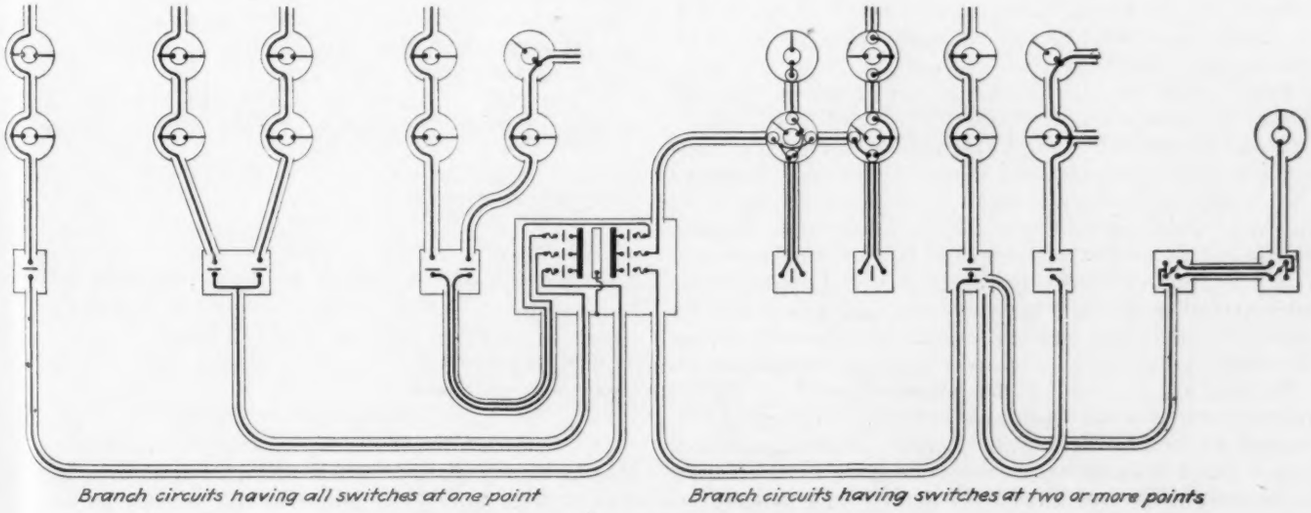
(a) That the neutral wire of the three-wire system shall be permanently and effectively grounded.
(b) That no grounded wire, whether of the branch circuits, feeder service wires or supply mains, shall have placed in it a single-pole switch or automatic cutout which operates to open that wire only.
(c) That the ungrounded conductors of the branch circuits shall be connected to the mains through fuses or their equivalent.

The code also requires that the steel conduit system shall be continuous from outlet to outlet and shall be mechanically and electrically connected to all panel, switch and outlet boxes, and that this continuous metal runway shall likewise be connected to ground. Thus each branch circuit conduit constitutes a conductor extending from the farthest lamp on the branch circuit to the steel frame of the distributing panel, at which the conduit may be connected to the grounded neutral wire. Since the conductance of a ½-in. steel conduit exceeds that of the No. 14 or No. 12 B & S grounded conductor of the branch circuit which it contains, this question arises:

> In branch lighting circuits which are installed in steel conduits, is it not feasible to omit the grounded wire of each branch circuit and to use in its place the steel conduit itself, thereby reducing the length of the rubber-covered copper wire required for branch circuit wiring to approximately 60 per cent of the length used under existing practice?

The omission of the grounded wire of the branch circuit will make feasible a further saving in material, since it will then be feasible to use ⅜-in. steel conduit in place of much of the ½-in. conduit and to use ½-in. conduit in place of much of the ¾-in. conduit. Again, since the labor for cutting, threading, reaming, bending and installing the smaller conduit is less than for the larger, and since the length of branch wire to be drawn into the conduit has been reduced by about 40 per cent, the saving in material will be accompanied by a marked reduction in the labor cost of conduit wiring.

**Portion of Professor Bennett's paper. "The Steel Conduit as One Conductor in Branch Lighting Circuits," presented before Electric Section, Wisconsin Utilities Association, Wausau. Balance of article will appear in a later issue.*



Conduit Used as Return Conductor

The magnitude of the yearly saving which would result from this change in practice may be estimated from the annual sales of rigid steel conduit in the United States. The estimate of these sales for the year 1927 is shown in Table I.

Upon the assumption that each ½-in. conduit carried two No. 14 wires and each ¾-in. conduit carried four No. 14 wires these sales of conduit would call for the sale of 636,000,000 ft. of No. 14 rubber-covered wire for branch circuit conduit wiring in 1927.

Assuming that under the proposed change in practice 40 per cent of this wire would be saved, that 50 per cent of the ½-in. conduit would be replaced by ⅜-in. and that 50 per cent of the ¾-in. would be replaced by ½-in. the estimated annual saving based on the 1927 sales would be as shown in Table II.

In addition to this possible annual saving of approximately four million dollars in the cost of the materials required for conduit wiring, there will be a further possible saving of a half million dollars in the cost of labor.

The saving in dollars is based on the unit prices shown in Table III, which represent the March, 1929 Madison, Wis., quotations. The prices on conduit are the quotations to contractors in carload lots, save for the ⅜-in. size. The price assumed for the ⅜-in. is much lower than present quotations on this size and it is based on the assumption that the quotations on ⅜-in. conduit will drop to this value when the ⅜-in. size is produced on the same scale as ½-in. conduit. The price on wire is the price of the contractor in 200,000-ft. lots.

Features of the Conduit-Return System

For the purpose of deriving a name for the purposed system of conduit wiring, it is convenient to regard the insulated wire of any branch circuit as the outgoing conductor of the circuit and the conduit as the return conductor, and to speak of the system as the conduit-return system of wiring.

Typical branch circuits of the conduit-return type issuing from a distributing panel are shown in the accompanying illustration. The ungrounded, or the insulated outgoing conductor of any circuit is represented by the heavy line, while the conduit which constitutes the return conductor of the circuit is represented by the two light lines. Each lamp or appliance receptacle is connected between the insulated outgoing conductor and the conduit. The outgoing conductor contains the single-pole circuit switches and the protective fuses, while it is absolutely essential that there be no fuses, no single-pole switches and no high-resistance joints in the conduit-return path of the current from the most remote outlet box on a branch circuit to the neutral busbar of the distributing panel.

Now the run of threaded conduit between the last lamp and the panelboard contains joints of two types, namely, the double joint from conduit to conduit through the threaded coupling and the double joint from conduit to conduit through a metal switch box or a metal outlet box. In the existing conduit systems, in which the conduit is not used to carry current, the practice is to make the joint between the conduit and an outlet box by clamping the wall of the box between a locknut and a bushing on the end of the conduit. In the conduit-return system, while this same method of clamping the conduit to the outlet boxes is retained, yet the metal box is not relied upon to act as the conductor from conduit to conduit. The metal outlet box is supplementary to the real conducting bond between the conduits which enter the box. The real bond is a link of No. 14 B & S annealed bare copper wire. This link terminates in a flattened circular loop at each end. To bond between two conduits which enter a box, each loop is clamped between locknuts and bushings on the ends of the respective conduits. If more than two conduits enter a box an additional link is used, and at the time the other soldered joints are made in the box the two links are soldered together at their mid-points. The links bridging between the conduits are not shown in the illustration.

This simple and effective link arrangement for getting the return circuit through the outlet boxes which occur in the runs of threaded conduit without relying upon the clamped contacts between the conduit and the outlet boxes has not been evolved in a day. It is the only feature which must be added to existing methods of installing rigid threaded conduit to insure against high-resistance joints in the return circuit

In the case of an outlet box joining two conduits, existing methods of installing conduit require the use of

	Cents
One outlet box and cover	14.0
Two ½-in. galvanized locknuts	0.7
Two ½-in. galvanized bushings	1.6
Total cost	16.3

while the use of the conduit as the return will require the use of

	Cents
One outlet box and cover	14.0
Four ½-in. galvanized locknuts	1.4
Two ½-in. galvanized bushings	1.6
One copper link	0.5
Total cost	17.5

That is to say, the additional fittings required to insure against high-resistance joints at the outlet boxes by bonding from conduit to conduit cost 1.2 cents per

Table I—Estimated Sales of Rigid Conduit in the U. S.

(For the Year 1927)

	Tons	Feet
Total rigid conduit	218,000	.....
½-in. conduit (estimated)	90,000	212,000,000
¾-in. conduit (estimated)	30,000	53,000,000

Table II—Estimated Annual Saving in the U. S. by Using the Conduit as the Grounded Conductor in Branch-Lighting Circuits

	Pounds of Steel	
Saving in replacing 50 per cent of the ¾-in. conduit with ½-in.	7,600,000	$ 370,000
Saving in replacing 50 per cent of the ½-in. conduit with ⅜-in.	30,400,000	$1,380,000
Total saving in conduit	38,000,000	$1,750,000
	Feet of wire	
Saving by omitting 40 per cent of branch circuit wire taken as No. 14 B & S.	254,000,000	$1,850,000
Total saving in cost of materials	.....	$3,600,000

Table III—Unit Prices Used in Estimating the Annual Saving

	Cost in Cents	
	Per Foot	Per Pound
½-in. galvanized conduit	6.6	5.84
¾-in. galvanized conduit	5.3	6.24
1-in. galvanized conduit	4.0	7.0
No. 14 B & S single-braid code rubber-covered wire	0.73	....

outlet box. The time required to install this bond will be less than the time required in the existing system to strip the insulation from the grounded wire at each outlet box and to tape up the joint on the grounded conductor.

The bushings for the conduit-return system differ from the present standard bushings in that the conduit-return bushings contain no shoulder. A bushing containing a shoulder which might jam against the end of the conduit before the bushing has seated on the link would not permit the wireman to know for certain that he had tightly clamped the copper link between the locknut and the bushing.

School for Cable Splicers

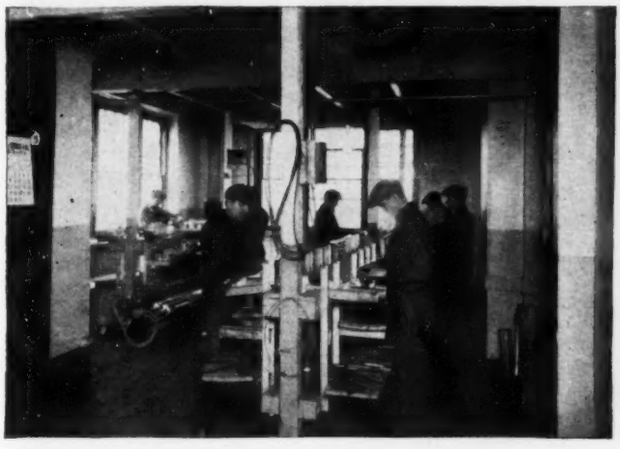
By C. H. CHASE
Distribution Engineer Brooklyn Edison Company

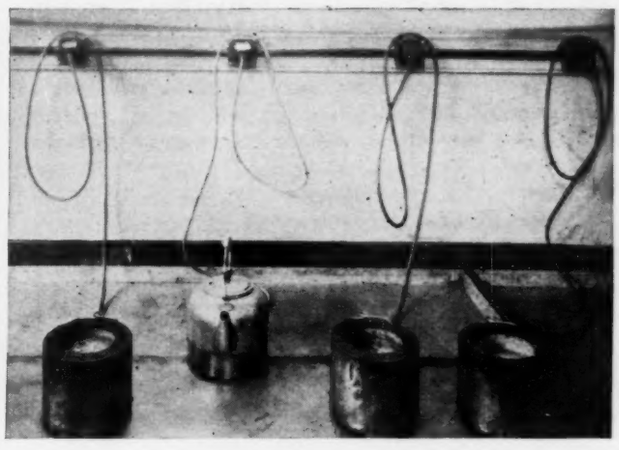
WHY do electric utility companies with underground facilities need to establish cable splicing schools? This question can best be answered by showing its development in the Brooklyn Edison Company and how this situation was met. Prior to 1922 this company had cables operating on 13,200, 6,600 and 2,400 volts for transmission and primary distribution with 120-240 volts for secondary and direct-current distribution. Although there had been established definite rules governing the procedure for constructing the cable joints on each of the above systems, they were not always closely adhered to by the cable splicers. At that time there seemed to be a tendency among cable manufacturers to be quite liberal in their insulation design. There were obvious reasons for this, especially for paper-insulated cables. The uniformity of the paper tape was somewhat uncertain as it seemed to vary in insulating quality. The machinery for applying this material was not then as highly developed, so that the paper was often wrinkled or torn while being wrapped, which had a tendency to leave small voids in the insulation. This high factor of safety in insulation, however, made the cable splicer's job less exacting in order to make joints that would stand successfully the operating voltages of that period.

In 1922 load and power plant conditions in Brooklyn made necessary the development of underground facilities for a higher transmission voltage. Engineering studies showed 27,000 volts to be most economical for this system. Then it became necessary not only to procure a three-conductor cable which would be capable of meeting this requirement but also to design a splice which would withstand without failure this higher working potential.

It was not difficult to design a splice which would be adequate to fill this greater requirement nor to have a splicer construct it in a laboratory under the direction of a cable engineer. The great problem was to train a large group of men who would be capable of making up this splice exactly according to the specification and under the difficult conditions which prevail in the ordinary manhole, where the air is sure to be humid and carrying particles of dirt from the city street. It was not feasible to place instructors in the manholes with the splicers because in many cases the space is not adequate, and even if it were the cost would be too great, since by this procedure one instructor could train only one splicer at a time.

These conditions made the cable splicing school a necessity, for any other method of building up a sufficient force of men trained to do this work would have been practically impossible. Therefore, a school was immediately organized to equip quickly the men who were already cable splicers with the necessary knowledge and skill to meet the higher requirements demanded in the construction of this high-tension cable joint. This school was decidedly successful from the very start, for the men thus trained made splices that could be depended upon.





A Section of a Cable Splicing School in Session and Electric Solder Pots and Kettles Used

About the same time the necessity for splices for 27,000-volt cables arose the system growth made the expansion of the underground facilities imperative. This increased the demand for all classes of cable splicers. It was then decided to conduct three classes in the school. For the lowest class men are selected from the cable splicer-helpers and are taught to make splices on single-conductor, low-tension cables, such as are used in mains and services. When the instructor is satisfied that a prospective splicer is qualified to perform this class of work he is thus assigned.

For the second grade in this school the men are selected from the lowest grade of splicers who have merited a chance for promotion by their ability and workmanship. In this class they are taught to make up multi-conductor cables up to and including 6,600-volt joints and are then

sent out to take up this work. By this same procedure men are chosen from this group to receive further instruction from the school so that they become capable of making 27,000-volt splices.

You will observe from the accompanying illustration that the benches at which the student splicers work are made up from stanchions and rack-arms similar to those used in the manholes. This, I believe, is better for the learner, since it more closely approaches manhole conditions than holding the cable by some clamping device such as some schools use.

It has also been found most helpful in giving this instruction to dissect joints and point out the imperfections and poor workmanship. Thus all joints on the system that break down are sent to the cable splicing school and there thoroughly examined and the cause of the failure determined. Such demonstrations vividly show the student splicer what is bound to occur if he fails to perform his work as he has been instructed.

The cable splicers' school has accomplished a fourfold purpose: Provided the number of splicers required, standardized the different types of joints, decreased system failures and strengthened the morale by affording means for personal advancement.

Protective Grounding Methods

AS THE burden of service reliability throughout all parts of electric service systems comes more and more upon relaying arrangements that control load changeovers and automatic substitutions of lines and other equipment, protective grounding in generating stations and substations assumes increasing importance.

Table of Ground Resistance

Station Ground:	
Major or important stations	1 ohm
Minor or less important stations	5 ohms
Isolated distribution stations	15 ohms
Arrester Ground:	
Isolated ground for station type arrester	5 ohms
Isolated ground for sure type arrester	15 ohms

This condition has been widely recognized and it has been variously stated in its details, but nowhere better than in a recent report of the Engineering Section of the Southeastern Division, N.E.L.A., from which the following points have been found:

Each generating plant and substation should be provided with adequate copper ground bars in trenches not less than 18 in. below the surface. Connections should be of non-corrosive material and stranded, except that lightning arrester grounds should be permanent, low resistance, adequate in mechanical strength and current-carrying capacity, and readily accessible for inspection; also free of fuses or cutouts, and any switches or test links should be clearly identified.

Protective inclosures of ground conductors are desirable but should not be of magnetic material in the case of lightning arrester grounds.

Ground connections should be made on the main side of the water meter, otherwise the meter should be jumpered.

Driven or buried electrodes should reach below the frost line to permanent moisture and be located at a natural point of depression if possible.

Local system of ground electrodes should be connected to piping system if within 50 yd.

Driven rods or pipes should be not less than ¾ in. diameter, copper covered, 8 ft. in the ground, six at 6 ft. spacing constituting one ground. Treatment of soil to obtain low ground resistance is not recommended because it is not permanent.

A later article will give specific information on ground capacities and connections.

Unbalanced Ratio Relay Serves Purpose of Three

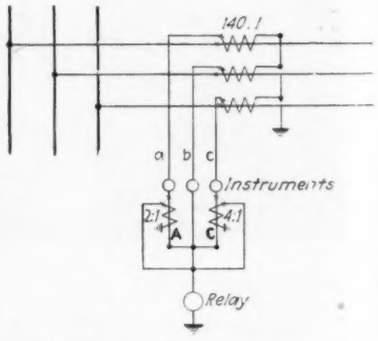
By C. M. Gross
Assistant Protection Engineer
Commonwealth Edison Company

THE problem arose on the system of the Commonwealth Edison Company of converting single-phase pilot-wire relay protection for several of the 66-kv. underground lines to three-phase protection. To apply the standard method of three-phase protection using three relays would have necessitated the replacement of the pilot cable because of the lack of sufficient number of conductors. Rather than do this, a scheme was devised whereby, with the addition of two current transformers, the three-phase protection was obtained still using only one relay. To explain the scheme as it is used in conjunction with the pilot-wire system of protection would be rather involved, so the explanation will deal with the scheme as it would be applied to a line on which simple overload relays could be used.

The current transformers "A" and "C," being of unequal ratios, produce at all times a neutral current. It is this characteristic of the system which effects protection for all types of faults. The current transformer ratios and the relay setting can be so chosen that with normal power flow the relay will not trip.

The short-circuit current was assumed to be ten times full load current for each different type of fault, and the tripping times for a "CO" relay under these various conditions are given.

The unbalancing effect produced by current transformers "A" and "C" will give unequal tripping time for different combinations of the phases involved in phase-to-phase and phase-to-ground short circuits, if an induction type relay is used. This time differential will not be objectionable in the majority of cases, but in case it should be an instantaneous relay could be used. Proper selectivity will be maintained between lines with the unbalancing current transformers, because the same degree of unbalance will be established over the whole system and the same value of resultant current will flow in the relays throughout the system involved in a given type of fault.



Unbalanced Ratio Relay for Three-Phase Protection

Type of Fault	Magnitude of Current (Amp.)	Seconds Required for "CO" Relay to Operate on 8-Amp Tap, No. 2 Lever Setting
With normal load current	560	Will not trip
Three-phase short circuit	5,600	0.65
A-phase to B-phase short circuit	5,600	0.60
A-phase to C-phase short circuit	5,600	1.60
B-phase to C-phase short circuit	5,600	1.60
A-phase to ground short circuit	5,600	0.40
B-phase to ground short circuit	5,600	0.45
C-phase to ground short circuit	5,600	0.43

Economic Necessity and Social Good

Harry Reid

Industrial development under the electrical dispensation is not counter to social improvement. On the contrary it is definitely favorable to it

By HARRY REID

President National Electric Power Company, New York, N. Y.

IT HAS been the felicitous experience of the electric power industry that the soundest business considerations have dictated precisely the course of action which is most desirable from the standpoint of sheer social benefit.

In its own quest for its logical market and the most efficient means of serving it, the electric industry has arrived at a stage of development in which social benefits would dictate irrespective of business considerations. And, since the nature of power supply so largely determines the course of civilization, this characteristic of electric power may be expected to go far toward forever disposing of the feeling that the interests of "business" and "society" are antagonistic.

Considerations of business efficiency and of profits led most of our industrial development of the past century into the paths of concentration, and earned industry, in many quarters, the label "anti-social." The cost of the goods produced was considerably lowered, and in that sense a benefit to society at large was conceded. But in other ways it was alleged—and not without reason—that our industrial development was having socially undesirable results. The conflict between business considerations and social welfare arising out of the course of industrial development during the past century may be briefly summarized by saying that mass production was the keynote of modern industrial development, and the keynote of mass production was concentration, accompanied, too often, by narrow specialization and unsatisfactory living conditions. In drawing industry and people from the countryside into crowded cities, our industrial development brought in its wake serious problems of big-city congestion and an equally regrettable dwindling of the countryside towns—a process in which many of the highest human values suffered or were lost entirely. The indictment against modern industry, as phrased by the socially minded, was that while the

THE central station industry has, in the order of things, its defenders as well as its detractors. But because it is more interesting to read an accusation than a defense, detraction of the central stations, their animations, their aims and their practices, usually gets the more newspaper space.

The superficial social philosopher, whose opinions are only reflections of newspaper headlines, is thus led to beliefs that are frequently upset by succeeding developments. For underneath the superficials are the fundamentals that in the long run are the true determinants of events.

Serious students of social tendencies, students whose lucubrations result in opinions entitled to respect, who occupy themselves with the fundamentals, have not infrequently questioned the social value of modern-day industrialism in which the central-station business plays so large a part.

An answer to those questionings is here presented by Harry Reid, who shows that the cure for the social evils of industrialism lies largely in one industrial factor, the central stations. More than that, he shows that the cure is not being offered merely; it has been accepted and it is operating.

The material of Mr. Reid's arguments is not new, its elements have been presented before, and quite often, but not, we believe, in so cogent a manner, in such a well-knit and logical structure as here. Mr. Reid gives us a brief, clearly phrased and effective defense of the electrical industry, a defense that rests solidly on basic social considerations.

citizen as consumer may have benefited, as worker he had suffered at the hands of modern industrial development. The discouraging thought grew that what was good for business could not be good for the people as a whole.

About four years ago a group of thoughtful, socially minded men, seeking a solution for some of the ill effects of our concentrated industrial development, collaborated on a survey of the possibilities of regional development and published their conclusions in the *Survey Graphic* of May, 1925. This group (and it included many who had been severely critical of the electric industry) may be taken as fairly representative of the "social" attitude toward electric power development. They saw that the cure for the existing industrial situation lay in a spreading out of industry and of population. They saw that electric power was capable of accomplishing this more humane, more socially desirable industrial set-up—unless social considerations were subordinated to purely business considerations. "The possibility remains," it was declared, "that unless men and women of vision bestir themselves to forestall such a tragedy the social history of the dawning electrical age may repeat that of the Industrial Revolution."

Electricity and Industrial Decentralization

What was the course of electric power development at that very time, under the direction of the men at the head of the industry? Looking back, it is instantly apparent that the conclusions desired by the socially minded group and the conclusions toward which the industry itself was then and is now directed, as the actual operation works itself out, are practically identical. From both viewpoints it was highly desirable that electric power function as a decentralizing agency. The viewpoint of the social philosophers, as might be expected, did not lead them to give weight to many of the practical elements of the power business and so details varied and means differed, but as to the end to be sought, there was and is unanimity between these two otherwise diverse viewpoints. The operator faced with his duty of protecting the investment for which he is responsible, finds himself on common ground with the social philosopher who, not confronted with the responsibility of protecting investment, is simply looking toward the maximum good of society.

What led the industry in this direction? Social considerations? We are entitled to believe that they were given all possible weight, and assuredly it would have been suicidal to have proceeded diametrically against them, but they alone could not have charted the course of the industry. With so much capital involved and necessary, the leaders of the industry could not indulge in philanthropy with the savings of thousands of people. Efficient use of investment is the inescapable duty of any undertaking, public or private. Any other course is sheer waste, and the reckoning will come sooner or later, whether in the form of a tax bill or otherwise. Adherence to these principles is absolutely necessary if investors are to be persuaded to place their money at the disposal of an undertaking. A stoppage of the return on the investment or a break in the safety of the principal—in short, the slightest departure from sound business principles—would instantly have arrested the development of electric power.

The happy circumstance was that sound business considerations and social considerations pointed in exactly the same direction—decentralization, diffusion, widespread distribution of power and, therefore, of industrial activity; in short, regionalization.

When electric power began to supplant steam power (or rather when steam, in its final development, was used to generate electricity, instead of to drive machines directly) it was found to have a characteristic never before possessed by any form of power—mobility. Thereupon it becomes possible to locate the machine anywhere, no matter where the source of the power might be. The distance between power generation and power use was no longer limited to the length of a leather belt. The art of electric transmission was gradually improved until distances of a hundred miles or more could be placed between power source and power application.

Justice to the investment for which they were responsible demanded that the leaders of the industry guide its development precisely in this course. In other words, the electric industry was guided into its regional viewpoint by the economic characteristics of the business. Large-scale generation and diversity of consumption—basic essentials of efficient operation—can be attained only if a reasonably large population is served. If the electric industry thought strictly in terms of towns (and until long-distance transmission was perfected it had to think in those terms) the quality and economy of electric service would vary directly with the size of the town. And so, at first, it did, when technical limitations forced the industry to think in terms of single communities. In thousands of towns it was impossible to render a satisfactory service profitably; the large cities, as a consequence held a conspicuous advantage over the small town with respect to power supply, and concentration of industry was encouraged.

As soon as it became technically possible electric power sought out its true market and undertook to serve it in the efficient manner which the new technique permitted, and which business considerations then dictated. When the countryside towns were able to obtain ample power cheaply, the era of decentralized industry began.

In thus heralding the end of concentration, electric power disposed of the most characteristic and typical fault of which modern industry was accused, the fault most frequently cited as evidence of a conflict between what is good for business and what is good for society. Today there is more than one disavowal of any such conflict (the recognition, for example, that consumer-purchasing power must be vigorous if business is to be successful), but the development of the electric power industry during the past decade or so was the first decisive manifestation of a complete reconciliation of the best interests of "business" with those of "society."

The fact that this noteworthy social advance has been brought about along sound business lines—with neither subsidy nor charity to help it, and with full safety and adequate compensation to the investors whose savings have made it possible—testifies to its strength and its endurance.

Rapid Development of Dutch Lamp and Radio Works

THE Philips Works at Eindhoven, Holland, manufacturer of lamps and wireless apparatus, is now employing 20,000 workers at its Eindhoven Works, as against 10,000 some fifteen months ago. The new additional plant includes extensive preparation school buildings, bakelite works and wireless apparatus facilities. With a view to further extensions, a big tract of land at

Nimeguen, Holland, has been secured, where building operations are well under way at present.

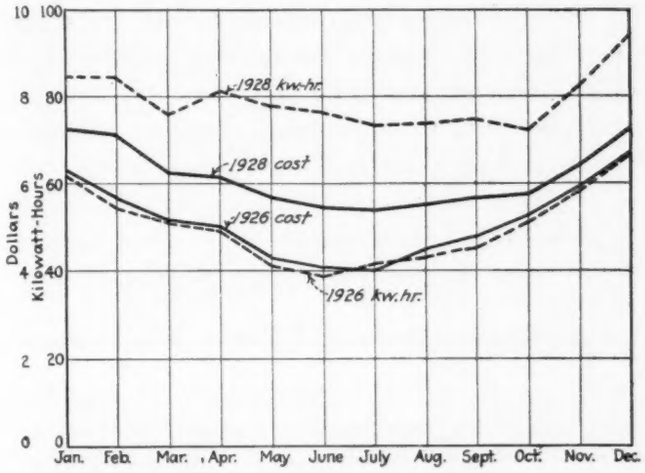
The Philips company has acquired a controlling interest in the Lorenz Company of Germany, manufacturer of telephone and wireless apparatus, and also bought one of the German machine works, in which special machines will be constructed.

Energy Use on New York Farms Increases 59 per Cent

By R. F. Bucknam
State College of Agriculture, Ithaca, N. Y.

A STUDY of the monthly kilowatt-hour consumption, monthly bills and the uses made of electricity during the two years 1926 and 1928 show that 122 New York State farmers used 59 per cent more electricity last year than they did in 1926. In 1926 the 122 farms reported used a total of 73,245 kw.-hr,, or an annual average of 600.36. In 1928 the total consumption for these same farms was 116,469, or an average of 954.66.

The monthly variation in kilowatt-hour consumption



Average Energy and Cost Values for 122 New York State Farms

and cost for the two years is shown in the accompanying figure. Study indicates that the increase in consumption was more marked from March to October than during the winter months. The weighted average for the amount paid per kilowatt-hour in 1926 was 10.6 cents. In 1928 these same customers paid on an average of 7.7 cents per kilowatt-hour. Part of this decrease in the amount paid per kilowatt-hour was due to actual decreases in the rates charged by the utilities and part due to the fact that with increased consumption a large part of the energy fell into blocks with a lower rate per unit.

During the two-year interval between the times the records were taken 529 additional outlets were installed on the 122 farms. Thirty of these farms reported 162 new outlets in their houses, eighteen reported 89 new outlets in their barns and nineteen reported 118 additional outlets in their hen houses.

Of the 122, 30 were using lights for egg production on an average five months each year. In 1928, 37 of the same group were using lights for approximately the same period.

Seven additional electric water systems were reported in 1928, but most of the changes in water supply were additions to existing systems. That is, in 1926 a water system had been installed in the house, but by 1928 it had been extended to take in barns, hen houses and other buildings. Twelve per cent of the farms reporting had added electric radios and 11 per cent had new electric refrigerators. Vacuum cleaners, washing machines, toasters, ranges and percolators were added by from 5 to 8 per cent of those reporting.

Fifty-one motors were added during the two years, ranging in size from $\frac{1}{8}$ to $7\frac{1}{2}$ hp. The most common size added were $\frac{1}{4}$ and $\frac{1}{2}$ hp. motors. There was little change in the average horsepower, the increase being mainly in numbers. Seven per cent changed to electric motors for milking machines and the same percentage introduced electric milk cooling on the farms. Seven brooders and four incubators were also added during this period.

Detailed tests were made on one of these incubators which had a capacity of 13,200 eggs. This incubator was started on February 7 and operated continuously until June 8, 1929, or a period of 121 days. During this period a total of 3,106 kw.-hr. were consumed, or an average of 25.67 kw-hr. per day. During the first 30-day period the average consumption was 29.5 kw.-hr. per day; during the second 30 days it dropped to an average of 24.9; in the third 30-day period the average was 25.7, and in the fourth, 22.8. The increment cost per kilowatt-hour for the current used in the incubator was 4 cents, therefore the added cost of electricity for operating the incubator was $1.027. A high percentage of the fertile eggs hatched. The user was very well satisfied; in fact, so well satisfied that he is planning to add a 10,000-egg machine next year. This customer used 1,302 kw.-hr. in 1926, 4,909 in 1928, and approximately 5,000 in the four months beginning Fegruary 1, 1929. Much of this added consumption was due to a new inducement rate put into effect about a year ago.

Operating Factors for Neon Sign Lighting

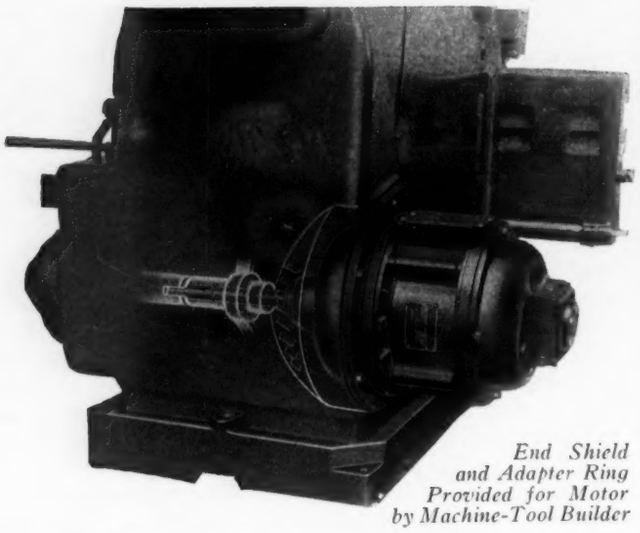
THE accompanying data for 12 mm. and 15 mm. tube neon signs represent the results of a comparatively large number of observations by the meter committee of the Southeastern Division of the National Electric Light Association.

Diameter of Tubing — Length of Tubing Ft.	In.	Total Watts	12 Mm. Total Volts-Amp.	A.C. Circuits — Power Factor	Watts per Foot
30	6	216	443	0.488	7.03
95	3	600	1464	0.41	6.30
116	0	905	1645	0.55	7.80
136	0	1600	4102	0.39	11.70
210	0	1806	4515	0.40	8.60
256	6	2975	7830	0.38	11.60
384	0	4070	9690	0.42	10.60
Average 175	5	1738.8	4241.3	0.434	9.09

Diameter of Tubing — Length of Tubing Ft.	In.	Total Watts	15 Mm. Volts-Amp. Total	A.C. Circuits — Factor Power	Watts per Foot
38	0	243	657	0.37	6.4
46	0	285	679	0.42	6.2
72	6	500	1041	0.48	6.9
86	0	516	1358	0.38	6.0
87	0	452	836	0.54	5.2
110	0	693	1386	0.50	6.3
124	0	756	1688	0.45	6.1
187	6	1087	1907	0.57	5.8
210	4	1073	2189	0.49	5.1
288	6	1327	3016	0.44	4.6
346	0	1453	3451	0.45	4.2
Average 145	0	762.3	1654.5	0.462	5.7

Electrical Requirements to Consider in Buying

Built-in Motors



End Shield and Adapter Ring Provided for Motor by Machine-Tool Builder

MANY industries are purchasing machine tools with the motors and control built in, or they are requiring that the builder equip them according to specifications. But in neither case has sufficient attention been given to combining the mechanical and electrical elements so the best results can be obtained from the combination.

No doubt machine-tool builders know the power requirements of their machines and the nature of control needed better than any one else, but can specialists in machine tool design be equally well posted on the electrical requirements, or vice versa, unless the suppliers of both classes of equipment work very close together from the start of design?

IN THE early days of electrified machine tools the tool builder felt he had done his duty by providing a bedplate on which a general-purpose motor could be mounted and from which a belt could be run to the in-driving shaft. With increasing realization of the many advantages of electric drive, the builder devoted more thought to the electric equipment, with the result that more unified and pleasing designs were evolved. Multi-motor machines, with separate motors for almost every motion, came into being. However, there is still a long way to be traveled before the greatest advantages can be derived from electric drive by both the builder and user. While thought has been devoted by the builder to the electric equipment, perhaps he has not known of all the possibilities about which he should think, nor has he thought about them at the most advantageous moment. In the following an attempt will be made to point out certain points worthy of consideration when designing a machine tool for electric drive, as well as to give suggestions for closer co-ordination.

Protection from Foreign Material and Accessibility for Inspection

Perhaps the first of these is the question as to where the motor is to be located. It is evident that a motor mounted on a machine should be so located that it will be protected from foreign material. Oil has a tendency to deteriorate the usual insulations used, although it is possible to furnish oil-resisting varnishes. Cutting compound should be kept out of the motor, and metallic chips should be prevented from entering. Frequently it may be impossible or not feasible to mount the motor where these requirements would dictate. In such instances special insulations on some form of inclosure should be used. One instance of this latter requirement is where cast iron is machined dry. Motor troubles were frequent until totally inclosed, fan-cooled motors were used. Since then troubles from this source have been practically eliminated.

Closely allied to this is the question of accessibility, particularly for direct-current motors. The mounting should be such that access to the brushes and commutator can readily be obtained for inspection or adjustment if necessary. It is also desirable that the motor bearings be accessible for inspection, particularly if of the oil-ring type. It should be possible to give bearings a yearly inspection and cleaning without dismantling the whole motor mounting.

The dimensions of the motors used are quite important. If the machine tool builder must be in a position to put on his machine any kind of motor which his customer might send in the cost of the machine will naturally be increased. On the other hand, the builder quite frequently does not make proper provision for the motors with which he might be called upon to equip his machine. For instance, a 25-cycle induction motor is usually larger than a 60-cycle motor of the same horsepower and runs at a lower speed. While the use of these odd-frequency motors is infrequent, the builder must be prepared to meet such special requirements. Also, direct-current motors are larger in diameter than induction motors and, in addition, have a long commutator end shield. These points are particularly important when the motor is mounted inside the machine, as, for instance, inside a lathe headstock pedestal. Consideration should also be given to whether an adjustable-speed, direct-current motor or a multi-speed, alternating-current motor may possibly be used, since they are larger than

By
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and
F. H. PENNEY
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General Electric Company

The accompanying article on co-ordinating machine-tool and electrical design brings out some requirements which are most frequently overlooked. Failure to observe them frequently places additional burden on the industrial electrical engineer in maintaining continuous service.

If every engineer will incorporate these requirements in specifications it may be hoped that machine tools with built-in electrical equipment will come nearer giving the service desired than if ignored. Furthermore, these requirements afford a basis for comparing the relative merits of such assemblies now available, from the electrical view point. Possibly industrial engineers can mention other requirements that are overlooked.

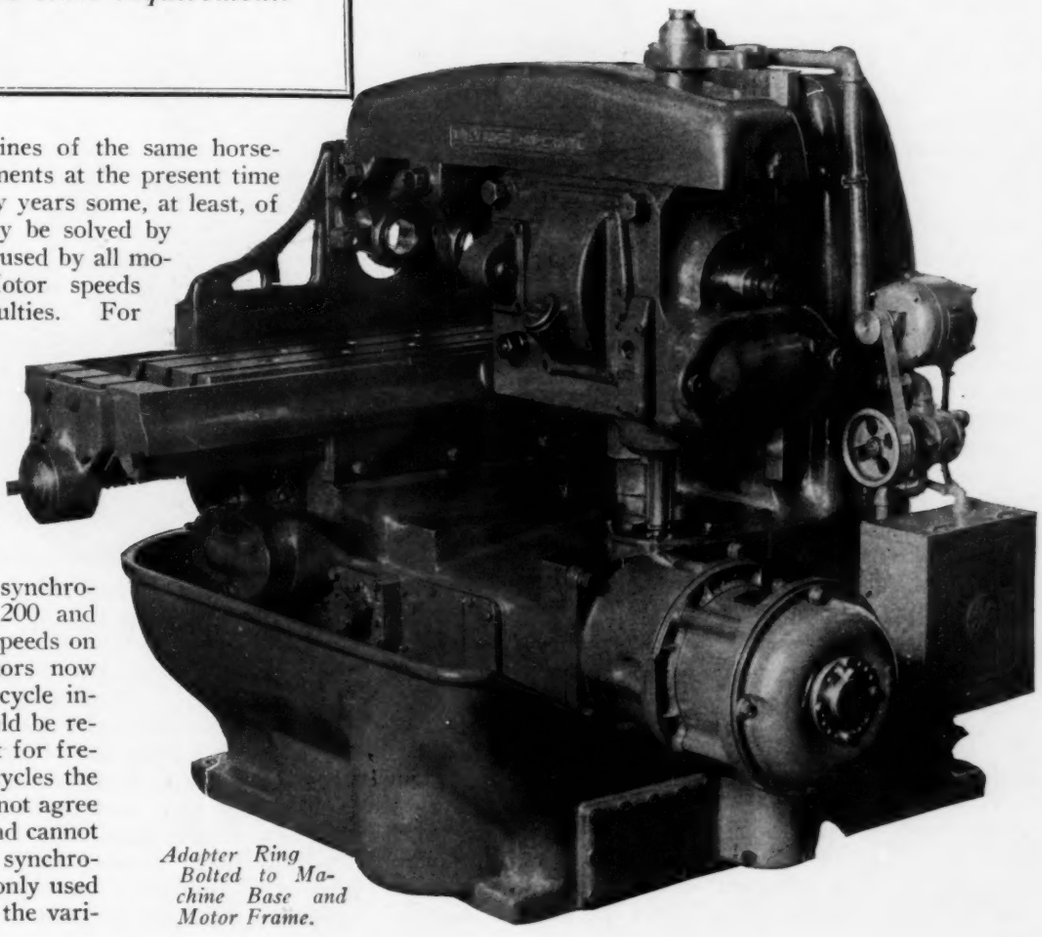
the constant-speed machines of the same horsepower output. Developments at the present time indicate that before many years some, at least, of the above difficulties may be solved by standardized dimensions used by all motor manufacturers. Motor speeds frequently cause difficulties. For direct-connected applications the in-driving shaft should be designed to run at a speed which corresponds to the full-load speeds of 60-cycle induction motors. Those most commonly used are 850, 1,150 and 1,750 r.p.m., corresponding to synchronous speeds of 900, 1,200 and 1,800 r.p.m. Full-load speeds on most direct-current motors now agree with those of 60-cycle induction motors. It should be remembered, however, that for frequencies other than 60 cycles the synchronous speeds will not agree with those given above and cannot be made to agree. The synchronous speeds most commonly used and which are fixed for the various frequencies are given in Table I. Full-load speeds will be approximately 4 or 5 per cent less.

If adjustable-speed, direct-current motors are to be used they should be based on the standard ratings and speeds agreed to by all motor manufacturers. Deviation from such speeds means longer shipments and higher prices and, in case of accident necessitating replacement, special speeds entail delay and loss of use of the machine.

If motors are to drive through belts or gears it is still advisable to make use of standardized motor speeds as outlined in Table II. This means that the motor builders' stock machines are applicable and it is not necessary to wait for special machines, either originally or for spare parts.

PROVISIONS FOR MOUNTING

As a means of getting the motor closer to the work and thus utilizing the power developed to the best advantage, machine builders frequently purchase motors incomplete and then combine the essential missing parts with those of their own machines, thus saving space, expense and weight. Perhaps the most common example of this is the motor provided with a flange which bolts against the machine. This flange can be either a separate piece, such as a ring welded around the field frame of a direct-current motor, or the pulley end shield may be machined around the bolt circle to definite dimensions. In other cases the entire pulley end shield is omitted. Under such conditions it is preferable to furnish the standard motor shaft, although special shafts can be provided to meet certain mounting requirements. The machine builder would then provide either a boss on his machine or on an intermediate adapter ring which would



Adapter Ring Bolted to Machine Base and Motor Frame.

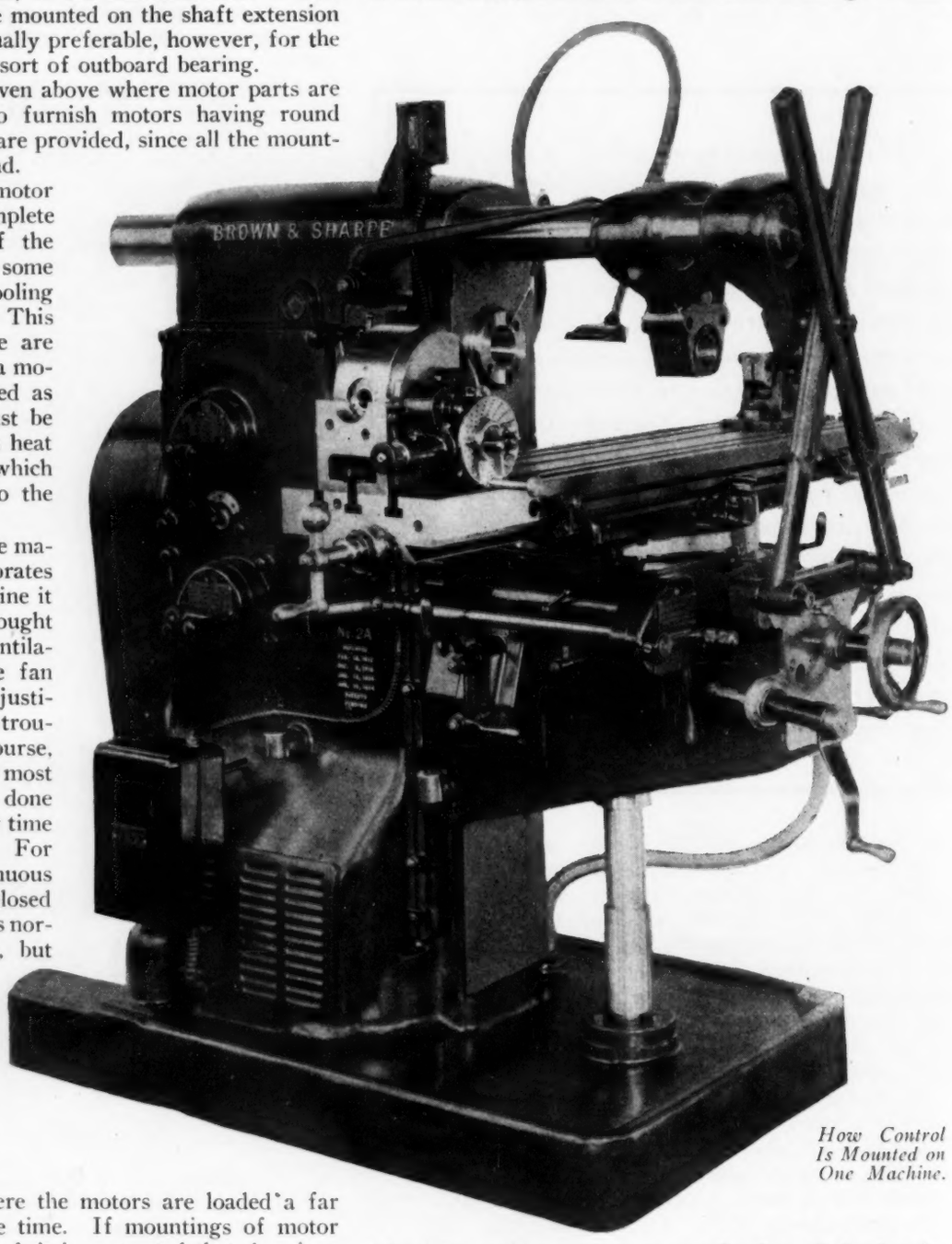
match the rabbet fit of the motor end frame. It is also evident that the machine builder must provide a suitable bearing for the drive end.

Going still further, both end shields and the shaft may be omitted, the builder incorporating these parts in his machine. In some cases, if the machine shaft is stiff enough, the rotor can be mounted on the shaft extension and overhung. It is usually preferable, however, for the builder to provide some sort of outboard bearing.

In all the instances given above where motor parts are used it is customary to furnish motors having round frames; that is, no feet are provided, since all the mounting is done from one end.

In all cases where the motor builder furnishes the complete motor, unless it be of the totally inclosed type, some means for adequately cooling the motor is provided. This is necessary since there are always certain losses in a motor which are manifested as heat. Some means must be provided to remove this heat or to limit it to a value which will not be injurious to the motor insulation.

Consequently when the machine builder incorporates motor parts in his machine it is necessary that some thought be given to adequate ventilation. Usually a simple fan properly located will be justifiable insurance against troubles later on. It is, of course, possible to inclose totally most motors, but if this is done either the horsepower or time rating must be reduced. For instance, an open continuous motor can usually be inclosed totally and will deliver its normal horsepower rating, but only for 30 minutes instead of continuously. Such motors are used on floor stand grinders, where the work is very intermittent, but would scarcely be applicable on the many special purpose machines used at the present time where the motors are loaded a far larger percentage of the time. If mountings of motor parts are being considered, it is suggested that drawings be submitted to the motor manufacturer for approval of the mounting methods.



How Control Is Mounted on One Machine.

Accessibility for Lubrication

In the past few years the question of lubrication of machine tools has received more and more consideration. Special lubricating systems have been employed. The driving motor, however, still continues as a separate unit. In the more usual forms of mounting on the machine the motor is readily accessible. On the other hand, many machines are now designed with the motor inclosed in the machine pedestal. Oftentimes insufficient thought has been given to getting at the motor bearings, particularly if of the oil-ring type. It is a comparatively simple matter to substitute a length of small pipe for the inaccessible filler gage and thus bring the gage out to a point where it can be useful. Care must, of course, be taken to insure that the oil level in the motor bearings is maintained to avoid starving or overflowing of the bearing.

In the case of ball-bearing motors, the use of grease cups or pressure fittings is to be discouraged. Too much grease in a ball bearing may cause more harm than good. Data indicate that at least as much trouble develops from overlubrication as from a lack of it, though the effects are of course not the same. The preferable method is to remove the motor at about yearly intervals and to clean the housings and bearings thoroughly and then repack with new grease, taking care to fill them not over about one-third full. In dirty locations the motor should be taken to a clean place, when cleaning and repacking, because the inclusion of even a small amount of dirt is

detrimental to any bearings, particularly a grease-lubricated unit.

One feature of the electric equipment which has been somewhat neglected by many machine tool builders is the control. It is self-evident that the control is of utmost importance, otherwise the machine would not function as intended by the designer. In the case of machines using small induction motors, simple and compact across-the-line starters are available which take up very little space. With the growing use of the self-starting motor, with its low inrush currents, such starters can be used for much larger motors than formerly. On machines

Table I—Synchronous Speeds

	Frequencies				
Poles	60	50	40	30	25
2	3,600	3,000	2,400	1,800	1,500
4	1,800	1,500	1,200	900	750
6	1,200	1,000	800	600	500
8	900	750	600	450	375
10	720	600	480	360	300
12	600	500	400	300	250

such as shapers, lathes, milling machines, etc., where space is a factor, these switches offer a very simple solution of the difficulty. In designing the machine a flat surface for mounting the control could frequently be provided if considered at the proper time. Formerly direct-current starters were much more cumbersome than the alternating current type, but in recent years much more compact starters for direct-current motors have been made available, particularly in the smaller sizes.

In the woodworking industry considerable use has been made of a small, compact form of alternating-current magnetic switch furnished without inclosing case, for mounting in a pocket of the machine. As many as six or seven such switches are sometimes provided on one machine to take care of the various motors. While such a procedure has not been followed extensively on metal-working machinery, it is perfectly feasible to provide starters, without cases, which may be mounted within the machine itself. Cases designed for machine mounting are made with rounded corners of large radius which blend with the general lines of the machine.

Must Consider Motors and Control as a Unit

To secure the best type of electric equipment for his machine and, consequently, the most satisfactory operation, it is desirable that the machine tool builder furnish his machine completely equipped electrically with that type of motor and control which he has found to be best suited to his requirements. This has already been done by several builders who guarantee their machine only when their choice of electric equipment is used. This procedure has several advantages.

When the builder furnishes the electric equipment complete, there is no divided responsibility as when the user supplies the motors or control. The builder has complete control of the mounting of the motor and can be certain it is properly aligned. He can also be certain that the control is designed to function to meet his requirements. Otherwise, while the builder may have designed his machine for a certain method of control, the apparatus supplied by the user may not provide the proper method of operation unless the builder has at least had a part in its selection.

For instance, in one case, the user specified a certain type of control on a large lathe. This was entirely different from what the builder recommended and did not provide nearly the flexible operation desired. In such a case both builder and user were inconvenienced and much time was lost before the matter was finally straightened out. If the builder had been allowed to furnish the complete equipment much trouble would have been avoided.

This applies with even more force to machines where the builder has used motor parts as outlined above under "Mounting." Here, unquestionably, the machine builder should furnish the machine with the motor included. It will be obvious that there is also a chance for a tool to acquire an undeserved reputation if the proper electric equipment is not installed.

A further advantage when the builder furnishes complete equipment is that he always knows what he is to furnish and can make provision for it in his designs. If he cannot do so, he must be prepared to put on any equipment which his customer may send in or specify. This works a hardship on the builder, and indirectly on the user, since the former is required to carry a wider variety of mounting fittings than would otherwise be required, or else to make them up special each time. This is reflected back to the user in higher costs and delayed shipment.

The user also profits by the fact that when he gets the complete machine it is ready to run. All he needs to do is to connect his line leads and press the button. This plan has been used extensively on woodworking machines and is gradually finding its way into the machine tool field, principally on the smaller and simpler machines.

On large and complicated multi-motor machines it is, of course, necessary to line up the complete equipment definitely, and in such cases the builder usually is in a position to specify what shall be used to give the sequence of operations and whatever interlocking of the various functions which might be necessary.

Co-operation Starts with Design—Not After

If the maximum advantages of direct motor drive with the proper control are to be secured, there seems to be only one way to obtain them. The electrical manufacturer and the machine builder must work together. This, of course, means that consideration on the part of the

Table II—Adjustable Speed D.C. Motor Ratings

Hp.	3-to-1 Speed Ratio R.P.M.	Hp.	4-to-1 Speed Ratio R.P.M.
2	700—2,100	¼	600—2,400
3	650—1,950	½	600—2,400
5	650—1,950	1	500—2,000
7½	600—1,800	1½	500—2,000
10	600—1,800	2	500—2,000
15	550—1,650	3	500—2,000
20	500—1,500	5	450—1,800
25	500—1,500	7½	450—1,800
30	500—1,500	10	300—1,200
40	500—1,500	10	400—1,600
50	500—1,500	15	300—1,200
		15	400—1,600
		20	300—1,200
		20	400—1,600
		25	300—1,200
		25	400—1,600
		30	400—1,600
		30	300—1,200
		40	400—1,600
		40	300—1,200
		50	300—1,200

tool builder must be given to the electric equipment while the machine is on the drafting board, or, better still, before the layout has been completed. A great deal of difficulty can be avoided if the application engineers of the electrical manufacturer are consulted before a line exists on paper. Undoubtedly there are locations which require special electrical designs and, where such a case arises, proper consideration should be given. However,

there are many applications where the chief advantage of a special motor seems to be only a talking point. Unless essential, it is well to avoid the special design of motor or control—standard parts, if adaptable, are recommended. It is surprising what can be accomplished with existing motor and control units if adequate consideration is given them from the beginning. There may be limitation, but these limitations, while important, are not serious as far as the machine design is concerned. However, successful operation is sometimes not secured because of failure to meet the motor or control requirements. It is much more feasible to modify a part or casting when it exists on paper only than it is after it is assembled on the floor.

One very logical and excellent way to obtain the maximum results is for the tool builder and electrical manufacturer to get together for a full and complete discussion of the problem. The actual difficulties, as with many other problems, are not great, but a lack of understanding more often than not is the real root of what appears to be a troublesome question.

Observation indicates that the motor mounting is often more thoroughly thought out than is the control mounting. The motor and control are of equal importance as to accessibility and appearance. They therefore warrant equal consideration where the design of the machine is being worked out whereby the user will receive a finished machine not only in appearance but in the quality of service.

High-Pressure Station Reliability

THE N.E.L.A. prime movers committee report cites the following operating experience of the Milwaukee Electric Railway & Light Company with a 1,300-lb. boiler and 7,000-kw. turbine in a station designed for 300-lb. pressure:

Period	May to December, Inclusive, 1928	Year 1928
Elapsed hours	5,880	8,761
Boiler hours	5,035	6,945
Boiler use factor	86	79.4
Turbine hours	4,785.2	5,993.6
Turbine output, million kw.-hr.	30.97	39.23
Turbine use factor	81	68
Turbine load factor	75	64.5

Erosion of the bronze impellers has prompted installation of steel ones.

The high-pressure equipment has necessarily carried its full quota of station load over the recent winters and from all standpoints has proved its commercial value. A second boiler unit has been purchased and plans for the quite near future contemplate installation of two more boilers and attendant high-pressure turbines.

The Edison Electric Illuminating Company of Boston reports that the longest continuous run of the new 10,000-kw. high-pressure turbine to date (February 9, 1929), is 172 hours. Although the turbine could have been run almost indefinitely, a longer run was not made because of low steam load on the station.

The Union Gas & Electric Company of Cincinnati has a 600-lb. unit and the longest continuous turbine run has been for 54 days, while rebuilding the second turbine from a 45,000-kw. tandem-compound unit to a cross-compound unit of 63,000 kw. capacity. During this same period the reheat boiler for the turbine operating had a continuous run of 26 days. It was taken off the line due to an economizer tube leak.

Turbine inspections have indicated that no undue erosion is had on turbine blades due to the higher steam density. A number of stages in the exhaust end of the low-pressure turbines were originally bladed with thin-edged blades. Cracks developed in these blades and they were replaced with ones of greater cross-sectional area and redesigned dovetails.

Estimating Byproduct Power

Need for short and easily applied method to arrive at preliminary estimate of power possibility. Curves permit approximation from figures on steam-pressure drop

By R. J. Gaudy
Executive Engineer Sessions Engineering Company, Chicago, Ill.

FOR ROUGH estimation of the amount of the byproduct power that might be taken from an industrial installation furnishing steam for process or space heating it is usually necessary to embark on a series of more or less involved calculations. By the amount of work they require, these calculations might just as well be made in full detail and with accuracy to the third decimal point in the first instance because the same ground would have to be covered later. Practically speaking, there is no quickly applicable method in general use by which an approximate evaluation of byproduct power availability may be reached for use in those preliminary conversational estimates that may or may not result in detailed analysis later. It is the purpose of this article to present such a method.

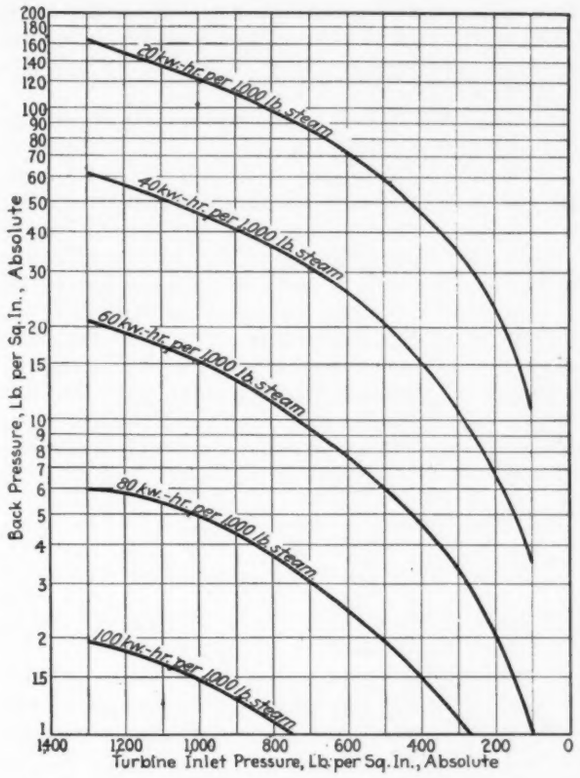
The quantitative element in byproduct power available from steam-pressure reduction may be most readily visualized if considered on the basis of weight of steam. Byproduct power from pressure differences is in no way related to power from waste fuel, from the waste heat of process combustion or from waste exhaust steam condensed through turbines. It is limited to that power which an industry can produce by generating steam at pressures within present ranges of practice, and then passing this steam through a turbine or engine and exhausting it at a pressure high enough to supply a definite process requirement for heat deliverable as steam.

When generated steam is passed through a prime mover and carried down to maximum vacuum, then the large quantity of latent heat remaining has been reduced in temperature below 100 deg. F., and in this condition it must be unloaded from the system. When heat in generated steam is reduced to the range between 180 deg. and 220 deg. it is suitable for space heating, water heating, and for many other purposes. The range from 220 to 240 deg. embraces most cooking and drying operations, and above this fall the temperatures suitable for vulcanization, steam drying, cellular breakdown and all those thermal processes where steam serves ably as the medium and where the latent heat is usefully availed of in the process consumption of the steam input.

Simple Unit Needed for Comparison

If power generation is warranted by other conditions the then justified losses of spinning under no electrical load make the use of bleeder turbines most effective, but for the simplicity of our measuring rule, we will consider the pressure ranges as though steam were taken into a turbine at a high generated pressure and exhausted at a pressure and temperature required by some process

heat or power need. Use of the concept of a definite number of kilowatt-hours produced by the passing of 1,000 lb. of steam from one pressure to another is made because of the general acceptance of steam usage in terms of thousands of pounds per hour. With kilowatt-hours generated per hour directly tied to readily understandable steam flow quantities there is an easy visualization of the amount of power capacity involved.


20 kw-hr. per 1000 lb. steam
40 kw-hr. per 1000 lb. steam
60 kw-hr. per 1000 lb. steam
80 kw-hr. per 1000 lb. steam
100 kw-hr. per 1000 lb. steam
Back Pressure, Lb. per Sq. In., Absolute
Turbine Inlet Pressure, Lb. per Sq. In., Absolute

Power Available from Steam Pressure Reductions for Process Use

The accompanying graph is laid out for 100 per cent turbine efficiency, so that the conversion may be ready and direct for substantial quantities. The actual yield in power may be taken at 70 per cent of that for the ranges plotted. The pressures shown are in pounds absolute (14.7 higher than plus gage pressures). Following vertically from any generated pressure and horizontally from any exhaust or process pressure the axis will intersect at a value which is quantity of kilowatt-hours that would be produced by passing 1,000 lb. of steam from the generated to the pressure used in the process. These values are plotted for a fixed superheat of 150 deg. above the temperature at the generated pressure.

In passing from a high pressure and, doubtless, with superheat, to a lower pressure, the characteristics of steam change in terms of available energy per pound, volume per pound, total heat, pressure, superheat and saturated temperature. The quantity, however, in rate of flow in pounds per hour is exactly the same out of as into the reducing turbine. The direct question is, therefore, with 40,000 lb. of steam per hour at 10 lb. pressure used in a process, how much power would be derived if this entered the turbine at 200 lb., 400 lb. or 600 lb.? Would the quantity of power be at all worth while and would the increase in its quantity justify generating steam at a higher pressure to give more elevation from which to allow the fall?

Results Are only Approximate

Each problem, if generation appears at all feasible, of course will justify a more thorough study on the effect of superheat variation, as this has a very marked effect on the available power. But this graph will be useful in visualizing the differences in ranges that have substantial energy values and in giving a picture for offhand study of the astounding dissimilarity of conditions which will produce identical yields in power per unit weight of steam passed. For example: On the curve for 40 kw.-hr. per thousand pounds, note that this power will be produced by passing from 400 lb. to atmosphere, and also the same production is possible by passing from 1,200 lb. to 55 lb. The influence of the larger volume changes at lower pressures is understood by all, but the wide variation in water rate on back pressure turbines and the magnitude of range between substantial pressures required for reasonable production are clearly shown by the curves.

An economic analysis of all conditions cannot be outlined, but an example recently studied showed the following: At the fuel price and rate of fixed charges obtaining, a steam process usage showed that to raise the pressure from process pressure to maximum practical pressure raised the capital expense per thousand pounds of steam by 2.4 cents. The proper charge for the true heat extracted as power at the average price per unit represented an expense of 2 cents per 1,000 lb. To equip with a turbine to pass the total steam, and to develop the total electric power and deliver it to the point of use, represented a total fixed cost, depreciation and attendance expense of 3.6 cents when reduced to each 1,000 lb. of steam used in the process. The chargeable expense, therefore, aggregated 8 cents. This expense, however, produced at 100 per cent efficiency 35 kw.-hr. per 1,000 lb.; at 70 per cent, therefore, approximately 24 kw.-hr. Under such conditions the power so derived was available at the very attractive total expense of $\frac{1}{3}$ cent per kilowatt-hour chargeable to the power only.

It should be apparent that such byproduct power from pressure differences is practical only when the differences of pressure are effectively great as indicated by the high yield curves and the quantities of steam are so substantial and so continuously used as to produce a considerable quantity of power over a substantial period in each year. Converted heat units have a base value, but the conversion must be at a rate per unit of time great enough to outdistance the interest charges which carry on regardless of load factors and ingenious ensembles of equipment.

The Stuff We Sell

By G. W. VanDerzee

Vice-President
Milwaukee Electric Railway & Light Company

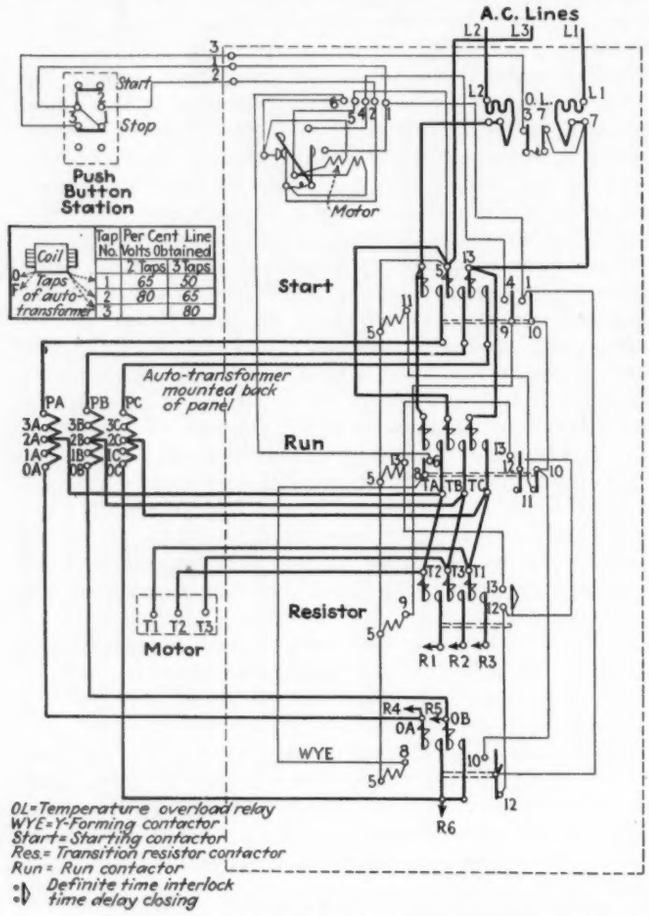
"GETTING a customer's viewpoint on what he thinks he is paying for when he buys utility service is an important step towards better service. We are not in the business of selling bare kilowatt-hours, cubic feet of gas and street car rides. These are merely the units to measure the quantity of service and are not the services themselves with which our customers come into daily contact. Such contact is more with the quality of our service than with the quantity of its units."

Motor Starting Current Reduced by Special Wiring

By H. L. Smith

Industrial Engineering Department, General Electric Company

IN ORDER to start automatically a 200-hp. squirrel-cage machine driving a centrifugal pump without exceeding 200 per cent of the full-load current at any time during the starting period special arrangements were necessary. The limitation of 200 per cent applied



Automatic Control Limits Starting Current to 200 per Cent of Running Requirements

to current not only when the motor was first thrown on the line but also during any peaks which might occur when changing primary resistance or when transferring from reduced to full voltage on an auto-transformer starter.

The blocked rotor current of this motor at full voltage was approximately 750 per cent of full-load current, with a starting torque of 95 per cent of full-load torque. It was necessary to use an auto-transformer starter with a 50 per cent tap; this combination gave approximately 23 per cent starting torque with a starting current slightly less than 200 per cent. On this tap the motor would accelerate the pump to very nearly 93 per cent of full speed.

While the Korndorffer system of starting eliminates the opening of the circuit to the motor and also reduces the transient which would occur when switching from tap voltage to full voltage, when transferring from a 50 per cent tap to full voltage at 93 per cent speed it would give an inrush current to the motor in excess of 250 per cent of the full-load current. It was necessary, therefore, to secure the effect of a higher voltage on the motor than that given by the 50 per cent tap before transferring to full voltage.

This was effectively secured by what is known as the Paul system. This system of starting is similar to the single-step Korndorffer system, but requires, in addition, a section of resistance to be connected between the tap on the auto-transformer and the neutral in each of the three phases and a contractor to cut in this resistance. Briefly, the sequence of operation is as follows:

For starting, the switch to the resistors is opened and the *Y* point of the auto-transformer closed. When the line contactor is closed the motor is started on tap voltage, just as in any case of auto-transformer starting. After a definite time the resistance is connected across the bottom section of each leg of the auto-transformer, and at the same time the *Y* point of the auto-transformer is opened. This resistance is short-circuited across the bottom section of the auto-transformer and reduces the reactance of the top section of the auto-transformer, which is now in series with the motor and gives the effect of a higher voltage on the motor. This allows the motor to increase its speed to a point such that, when the motor is connected to full voltage, the current is less than the 200 per cent limit.

Machine Shop Illumination

THE machine shop of Chandler & Price Company, Cleveland, manufacturers of printing presses and paper cutters, is lighted by means of 51 Cooper-Hewitt "Work-Lights," which have reduced the cost of current by nearly $100 a year, have eliminated the former loss through theft of bulbs and have increased shop efficiency approximately 5 per cent, evaluated at $30.87 per day, according to a survey recently made by the A. C. Nielsen Company, Chicago. The shop requires artificial lighting throughout the nine-hour working day. Drilling, boring, milling, planing and turning operations are performed and it is essential to have sufficient light for accurate gaging and calipering.

Savings Effected with Cooper-Hewitt Lamps

Operating Cost of New Installation	
Depreciation on first cost plus installation—$1,122.00 + 10 years	$112.20
*Average interest at 6 per cent—11/10 x $1,120 x 0.06/2	37.03
Repair and maintenance allowance	102.00
Cleaning labor—26 hours at $0.55	14.30
Current—51 x 0.385 kw x 9 hours x 275 days at $0.025	1,214.91
Cost per year	$1,480.44
per day—$1,480.44 + 275 days	5.38
per lamp per day—$5.38 + 51	.105
per man per day—$5.38/98	.055
per 1,000 sq.ft. per day—$5.38 + 18.75 sq.ft	.287
Former Costs	
Fixed costs not considered	$
Replacement of bulbs, including theft	450.00
Current—(70¾ kw.-hr. more than Cooper-Hewitt units)	1,701.31
Total	$2,151.31
Savings in Cost of Illumination	
$2,151.31—$1,480.44	$670.87
Net return on first cost of new installation	60 per cent
Shop Efficiency	
Estimate of increased efficiency	5 per cent
Evaluation on basis of payroll—	
98 men x $0.70 per hour x 9 hours x 275 days x 5 per cent	$8,489.25

* Allowing for interest earned by depreciation reserve.

Avoiding the Pitfalls in Export Trade

By MARSHALL T. JONES
Chief Electrical Division
Bureau of Foreign and Domestic Commerce

Certain precautions based on experience of Department of Commerce enable exporter of electrical equipment to avoid losses

ALTHOUGH there are numerous articles in use today which have been exported for many years, even in the early days rounding the Horn in the old clipper ships, few have been attended by the difficulties which beset the selling of electrical goods in foreign lands. Steel is steel wherever it be, likewise tractors, automobiles, etc. But the various irons, wiring devices, meters, etc., must of necessity be fitted to use the life-giving current available in the place they are destined for. Should the wrong information have been given as to the type and kind of "juice," then the particular article is usually about as useless as the proverbial "fifth wheel."

The Perpetual Motor Company—taking an imaginary concern through probable experience in relation to exporting—had gone along for years enjoying an excellent domestic business, filling occasional unsolicited orders from abroad in a half-hearted manner, deeming the effort to establish an export trade not worth the reward. Discussion has turned as to the ways and means of enlarging the business. One path leads to foreign fields, and so the company officials cast around for a likely man to organize and handle that department. After considerable delay, they decide upon A. B. Blank, who has had practical experience in foreign fields.

The first thing Mr. Blank does is to settle down at the factory, which is located, we'll say, in Ohio. He dons overalls and goes through the plant from beginning to end, taking two months, or at most three, until he feels that he is fairly familiar with the motor his company turns out.

The export department has been put on a fixed budget for the first year, so that Mr. Blank has, besides himself, a stenographer and a young man clerk. He has explained carefully to the company that it may expect to lose money for the first year or so, until he has had a chance to get going, to which it has reluctantly agreed.

BEST METHOD OF PROCEDURE

When Mr. Blank feels that he has at least a speaking acquaintance with the article he is to handle his next thought is, how to proceed? There are at least two ways. One is to attempt to get agents abroad through correspondence; the other is to go abroad personally and pick the agents. A combination of the two will perhaps bring the best results, and so Mr. Blank, having met some of the commercial attachés abroad representing the Department of Commerce on his previous travels and knowing of the domestic offices maintained by the bureau, addresses a letter to the Bureau of Foreign and Domestic Commerce in Washington, stating his problem and asking for suggestions as to how he should best proceed His probable reply follows:

With reference to your letter of February 21 regarding your desire to enter the export field, I find that your company is not listed on our Exporters' Index. This is a list of American firms which have signified their interest in exporting by filling out our Form 57, which is inclosed. Kindly have this executed in duplicate and return to me through our district office, located at ———. Upon approval, your company will then be entitled to the full services of the bureau.

As regards your problem of starting your campaign to establish contact with foreign agents to handle the Perpetual motor, there are three ways open to you. The first is, to my mind, the best. It is for you to take a series of trips, eventually covering the world, and personally select those firms which are to carry your banner through to success. Provided that it is not practical at the moment, I would suggest that you circularize lists of importers in the various countries, which lists may be obtained from our Commercial Intelligence Division. Then from the replies received, you may be able to locate an agent. The division just mentioned also has sales information reports on a large number of foreign firms, so that you could check up on individual concerns.

The third method that you might employ would be to send me complete literature regarding your motor, including catalog, prices, etc., which I will in turn transmit with a covering letter to our foreign offices, requesting that suitable agents be recommended. The literature should include a catalog fully describing the product. Prices should be f. a.s. (free alongside steamer), New York, and complete data as to shipping weights and measurements, packed for export, so that the prospective agents can determine the ocean freight from New York to the port of destination. Of course, the other way would be for you to figure the c.i.f. prices at various foreign ports, but this would entail considerable work on your part. It would be, however, worth the effort because of the completeness of the picture to offer the foreign firm. These prices need not be firm, as the notation could be made that they were figured on a certain freight rate, which might change by the time the letters reached our offices abroad. However, it may be to better advantage to quote in the manner first named.

Then something about your company, its history, etc., for you must realize that while most people here are familiar with the name of your company, the foreign firm, more than likely, has not the slightest notion as to who you are. Give me just such information as you yourself would wish to know about a foreign firm approaching you to handle its line here in the United States.

If at all possible, it would help considerably if you could have a small pamphlet printed in Spanish describing your line of motors, for use in the Spanish-speaking South and Central American countries, excepting Brazil, and in Spain as well. We would be glad to go over the proof before it is printed, as our Latin-American section may be able to offer helpful suggestions. Or it may perhaps be able to put into proper Spanish what you write in English, if a Spanish translator is not available to you.

One point regarding European trade needs mention. When I write to our offices there, I would like, with your permission, to state that when business warrants, you will establish a central distributing point at one of the ports of Europe,

such as Hamburg or Antwerp, where stocks of motors and parts will be held ready to supply your agents' needs, without the delay of having to wait for shipments from the factory. This will make an added attraction for the agent. The expense involved will not be great, as, for one thing, you can always make carload shipments to New York, with free lighterage to the steamer, and the European port selected would be either a "free" one or have bonded warehouse facilities.

There is one thing I have found very hard to get from American firms, and that is, their tentative agency agreement form. After all, when we have put you in touch with an agent, the agreement proposition will naturally be his first concern. So why not include it in the initial negotiations, as eventually time will be saved. There are some firms doing export business without such agreements, and it may be possible for you to dispense with them in later years. But it protects the agent through the period of building up the business. It would be better not to insist on any definite quotas for agents to take; it may lead to initial dissatisfaction. You may be sure that the proper agent will be keen to make all the money possible, provided he is satisfied with your company and its product, but high-pressure sales talk will not make much headway with foreign firms, as they do not understand it.

If you will return the form 57, as outlined above, and send me 100 sets of the literature mentioned, I can then forward two sets to each of 50 of our offices abroad, and as the replies come in, they will be transmitted to you for consideration. It will not be possible, in many instances, for our field men to locate suitable agents immediately, but you may rest assured that they will do everything possible to interest a good firm in your proposition.

As of possible interest, I am inclosing tabulations covering exports from the United States, during 1928, of electric motors under 1 hp. and from 1 to 200 hp., by countries of destination. You will note that American motors are shipped to practically every country in the world, and that Europe offers a really good market for the small ones. One reason for this is their quietness in operation, when used either on office or home appliances.

Our Division of Foreign Tariffs will be glad to advise you of the existing duties levied on American motors by the various foreign governments, should you desire such information. There are certain regulations governing installation of motors in some of the countries, such as requiring the neutral to be grounded, which I will be glad to acquaint you with later on. And of course the kind of current available must be known, but I have that all here on file, and can furnish you with this information for practically any city in the world. Three bulletins have been printed so far, covering Africa, Australia and New Zealand, and the Western Hemisphere, respectively, giving the current characteristics of the cities in these areas. Special circulars are available giving these data for a number of countries, as well as for the principal cities of Europe and Asia.

It may also interest you to know that the bureau maintains an office located at ——— in ———, which will be glad to be of service to you at any time.

Awaiting your advices with interest, I am

Yours very truly,
MARSHALL T. JONES,
Chief Electrical Equipment Division.

Mr. Blank receives this reply with a great deal of encouragement, as he had no idea such co-operation was available for the asking. The first move is to attend to Form 57 and then set about making up the pamphlet in Spanish and through the local railroad offices obtain current ocean freight rates from New York to the more important foreign ports, with a view to determining if it is possible to give c.i.f. quotations. Realizing that the motors must be well protected for foreign shipment, he goes over the details of the packing with the shipping department and obtains the list showing weights and measures, when packed, of the various sizes of motors manufactured by the company.

From previous experience Mr. Blank feels that it will be best to quote a discount from the list price, rather than to use a net figure. He must take into consideration the fact that export packing costs a little more than for the domestic market, and finance and credit insurance charges must be allowed for. This credit insurance is covered by several companies for a given percentage fee, and of course depends upon the foreign firm so insured against. It is not a blanket form of insurance given against all export shipments made by an American firm. By quoting a certain discount off the list price, to apply, say, f.a.s. steamer New York, which would include all charges to that point, controversies are avoided which might arise if extras were mentioned for packing, financing, etc. There is another item, too, that must be taken care of; that is, covering a share of the agent's advertising expenditures. Usually an additional 2½ to 5 per cent discount is allowed, which understanding is put in the agreement. Or, this being decided against, still a certain amount must be set aside, shall we say, to cover amounts to be spent by the company itself for foreign advertising, with constructive criticism by the agent in the country involved.

So Mr. Blank, having in hand all the necessary material, sends it along to Mr. Jones in Washington, who, in turn, transmits two sets of the literature to each of 50 of the bureau's offices, accompanying them by letters asking that suitable agents be located. In due course of time the replies come in and are forwarded to Mr. Blank. In those countries where prospective agents have signified their interest, these agents communicate direct with Mr. Blank, and then the balance of the negotiations are carried on between the American and the foreign firm.

As to terms of payment, this must be determined upon by Mr. Blank in conference with the credit manager of his company, and may range from irrevocable, confirmed letter of credit, established at the time the order is placed, to 90- or 120-day draft, depending entirely upon the standing of the foreign firm and the amount of business involved. While at first it may be necessary to require a letter of credit from a certain firm, as time goes by, with transactions satisfactory, more liberal terms may safely be granted.

THE ESTABLISHMENT OF AGENCIES

After six to eight months Mr. Blank finds that he has already obtained ten good agents in as many countries, is negotiating with half a dozen more and has started making shipments. He then approaches the president of the company and lays before him a plan to take a trip abroad, in order to become personally acquainted with the agents already functioning, to fill up the gaps in adjacent countries, and to obtain first hand information as to the problems these agents may have, and possibly to make some suggestions. His plan is to cover Europe first, and also to look into the possibilities of establishing a central warehouse stock there. The permission obtained for the trip, he writes to Mr. Jones in Washington asking for a letter of introduction to the commercial attachés, and as he is going first to London, one is sent to him for presentation to the attaché there, and then he will be passed along from office to office.

Upon arrival in London, he presents this letter and obtains what information he desires, together with helpful suggestions, confers with his agent, and then goes on through the various other countries, hooking up with new agents in places not already covered, until he feels that things are pretty well lined up. He has had some difficulty with the different languages, but the attachés and consuls have been able to recommend suitable men to act as translators. So back again to the United States, to pick up the loose threads. The president of the company seems to be well pleased with the results of his trip, so that there is no objection made to his taking one to the South American countries, with equally satisfactory

results. Then to the Far East, Africa and Australia, and the world is covered. This, of course, takes place over a period of several years, and finally Mr. Blank returns to his desk with the feeling of a job well started. From then on it becomes a matter of building up the trade, of seeing that the agencies are kept fully informed as to developments, advised of shipments made, etc. Wherever possible, he induces these agents to come to the factory and spend some time in going through it and becoming acquainted with the various executives, thus binding them closer to the company through the bond of friendship.

In conclusion, there are a few major points brought out in the foregoing, which may be set down as follows:

1. Do no rush into an arrangement with a foreign agent simply for the sake of having a representative. Check him up as carefully as possible, to make sure you have the right kind of firm.

2. Live strictly up to your part of the agreement.

3. Make sure that shipments go forward promptly, irrespective of the state of domestic business. Have it understood within your company that you have a call upon at least a certain percentage of production, for export, and that your orders are not to be subject to delay because the home market is booming.

4. Keep your agent fully advised as to the status of his orders, even though it may be only an acknowledgment. As a rule, in foreign countries the mail from the United States is received only once a week, and should you fail to make one mail your agent must wait another week before it is possible for a letter to reach him. Tell him that you went through the plant that morning and that you saw his order going through, that all it needed was to have a coat of paint, or whatnot, but show him that you personally are looking out for him.

5. If not too expensive, place advertisements of your produse in foreign trade magazines and those in America having foreign circulation. For example, British trade publications are read in practically all of her colonies, likewise French, Spanish, etc.

6. Do not send out high-pressure sales letters to a whole list of importers and give each and every one of them the details as to your agency requirements. Circularize them if you will, with a dignified letter, and let them ask for details if they so wish. For the agent you eventually select may have need to sell to some, if not all, of these other firms.

7. Sometimes it is necessary to make certain allowances on claims, simply for policy. Do so with a good grace, do not make the agent feel that you are simply doing this out of kindness, but that you realize his position. There of course is a limit to this.

8. Acquaint the commercial attachés and consuls with the names of your established agents, so that they may have their records complete, and not attempt to place another motor agency with the foreign firm already holding yours. At times changes may be necessary, and the attaché or consul will be very glad to be of assistance, if within his power.

9. Above all, make your agent feel that you are his friend, that by co-operation both of you prosper. But at the same time, in most cases, it is necessary that the initiative come from you, as the ways and means of increasing the sale abroad of your products.

Eight Suggestions for Jubilee Effects

By Ward Harrison
Nela Park

Arranged in their inverse order of cost and direct order of their effectiveness.

Dip the globes of the regular street lights in a gold tint and use a one size larger lamp where possible.

Develop lateral light festoons, using either gold or canary colored lights or regular lamps dipped for temporary use, these to be suspended from the buildings to lamp poles on the side, extending only over the sidewalk. This gives a golden bower over each of the sidewalks and produces a beautiful effect looking down the street. This was used on Atlantic Avenue at Atlantic City with very marked effect during the National Electric Light Association convention in June.

Small communities wishing to produce special effects would do better to concentrate on one center, either the public square, the city hall if this is suitable, the park or foilage of a central point, or perhaps only a statue erected in a conspicuous place.

More extensive festoons can be erected in built-up centers by extending cables between the second stories of buildings and hanging therefrom festoons, either of the simple string type or developed into a lacework affair, as shown in many of the illustrations of the July 20 issue.

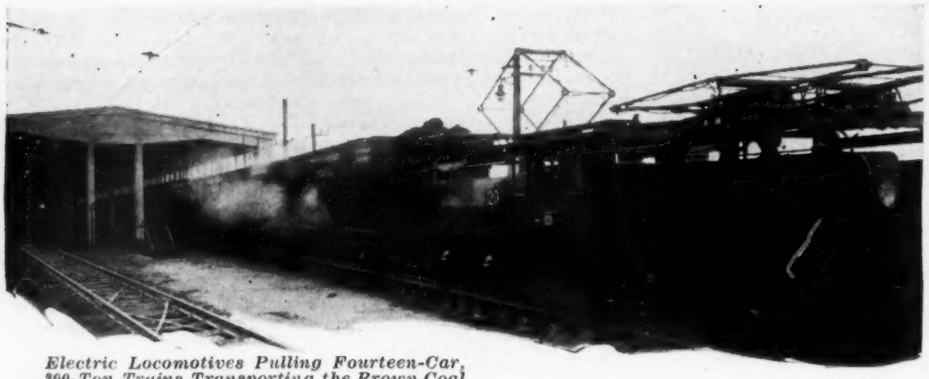
A night parade with lighted floats offers possibilities of an entirely different type. The further advantage of this type of celebration is that it is quite easy to split up the expense among different stores, manufacturing institutions, probably headed by the light and power company. The illumination would generally have to be by storage battery lights, the batteries being rented from garages for the period of the evening. The illumination can either be by low-voltage lamps in multiple or eighteen to twenty batteries can be connected together, giving the usual voltage. If there is a reviewing stand or grandstand erected at any particular point, illumination of the floats can be augmented by the use of floodlights.

Public-speaking equipment can be installed in the central square in many communities that will be connected to the broadcasting system on the night of October 21 and thus allow a large congregation to listen to the program, which will be international in character.

Individual theaters in the city may be persuaded, perhaps with some outside help, to install public-speaking systems temporarily and broadcast during the evening of October 21 portions of the international program for, say, periods of fifteen or twenty minutes. It will be a simple matter to arrange most programs so that this could be accomplished.

The festive spirit, although not indicative of electric light, can be obtained by fireworks or a combination of fireworks and a loud-speaking system and furnishes a demonstration that is always of great interest.

Central Germany System Passes



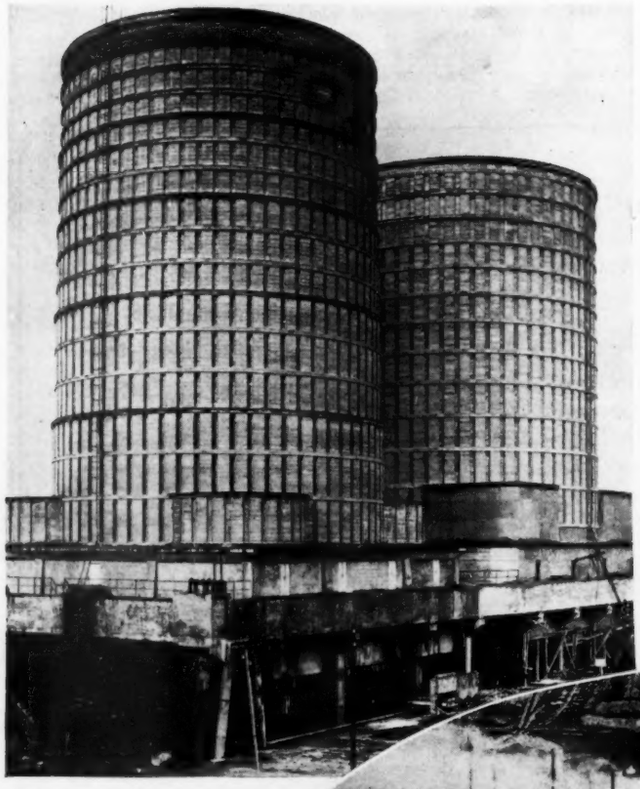
Electric Locomotives Pulling Fourteen-Car, 300-Ton Trains Transporting the Brown Coal to Bunkers of Golpa Plant

RECORDS of the Electric Power Corporation of Berlin show an increase of 1,700,000,000 kw.-hr. in annual output since 1916, or 570 per cent in eight years.

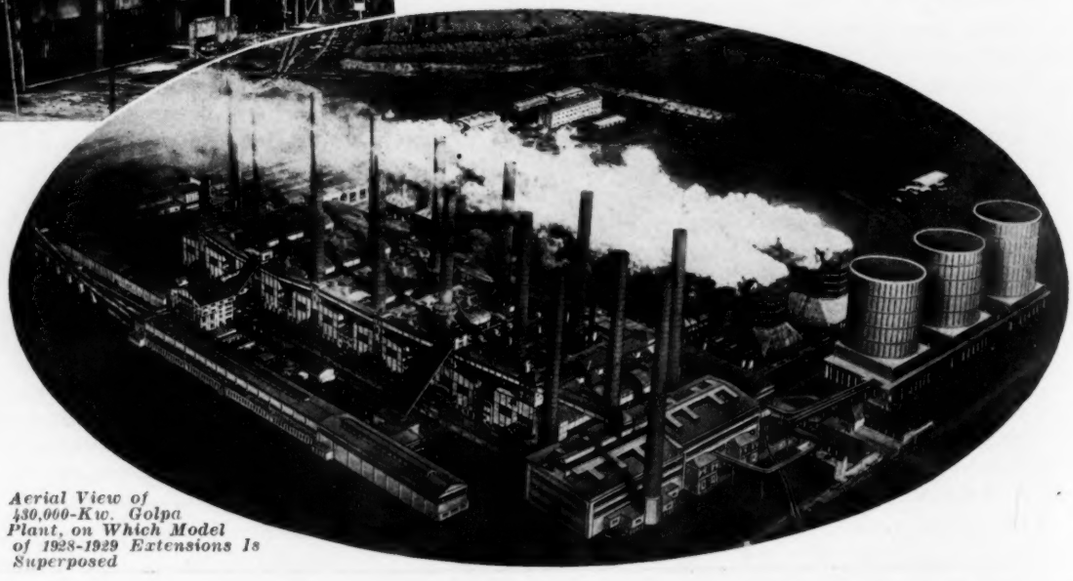
Power is sold exclusively in bulk to a few big customers or to other retailing power corporations and municipal systems. The three power plants of the company, Golpa-Zschornewitz, Lauta and Trattendorf, were planned and built during the war for the power supply of some near-by chemical works. Today, still, a large portion of the output is used for this purpose, but the big load centers of Berlin and Leipsic offer expanding power markets. The agreement with the Berlin Municipal Power Corporation alone, for example, provides for a load of 80,000 kw., which may be increased to 110,000 kw. in the peak months. Interconnections with the Saxon and Silesian Power Corporations are shown on the map. Thus the Electric Power Corporation controls to a great extent the power supply of central and southeast Germany with almost one-third of Germany's population within its boundaries.

Due to the fact that a great part of the system load is derived from chemical and electrometallurgical works in continous operation, the load factor of the three plants is rather high as compared with other European systems: Zschornewitz, 56 per cent; Lauta, 56 per cent; Trattendorf 47 per cent. The use factor of the running units averages around 80 to 90 per cent, while the ratio of peak load to installed total capacity in 1928 was 85 per cent.

Heavy construction work is under way and will be completed by the fall of 1929. The Golpa plant is



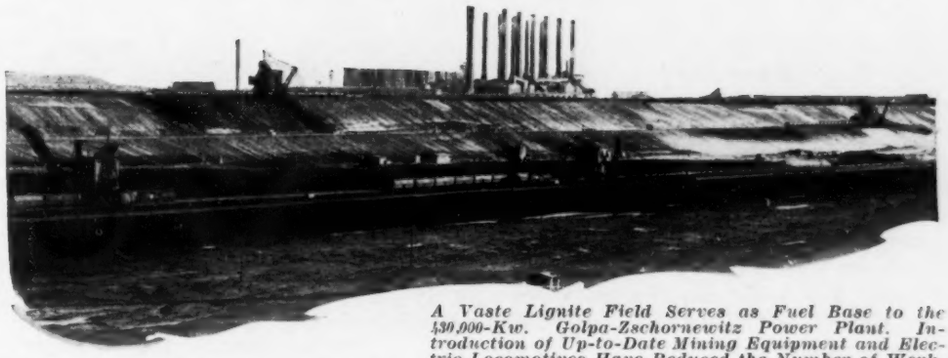
Concrete Cooling Towers Have Proved Efficient and Durable at Trattendorf and Three Are Under Construction in Zschornewitz



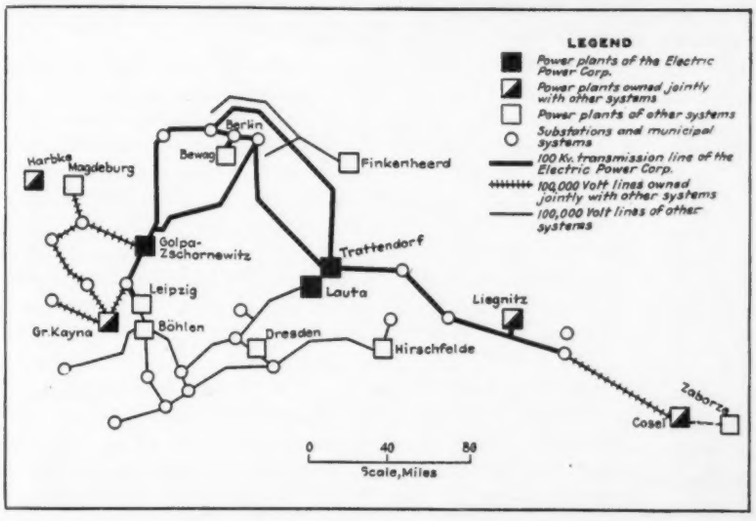
Aerial View of 430,000-Kw. Golpa Plant, on Which Model of 1928-1929 Extensions Is Superposed

2,000,000,000-Kw.-Hr. Mark

By
DR. W. BRESLAUER



A Vaste Lignite Field Serves as Fuel Base to the 430,000-Kw. Golpa-Zschornewitz Power Plant. Introduction of Up-to-Date Mining Equipment and Electric Locomotives Have Reduced the Number of Workmen from 4,000 to 1,200 Within a Few Years



Power Plants and 100-Kv. Lines of Berlin Electric Power Corporation and Interconnected Systems

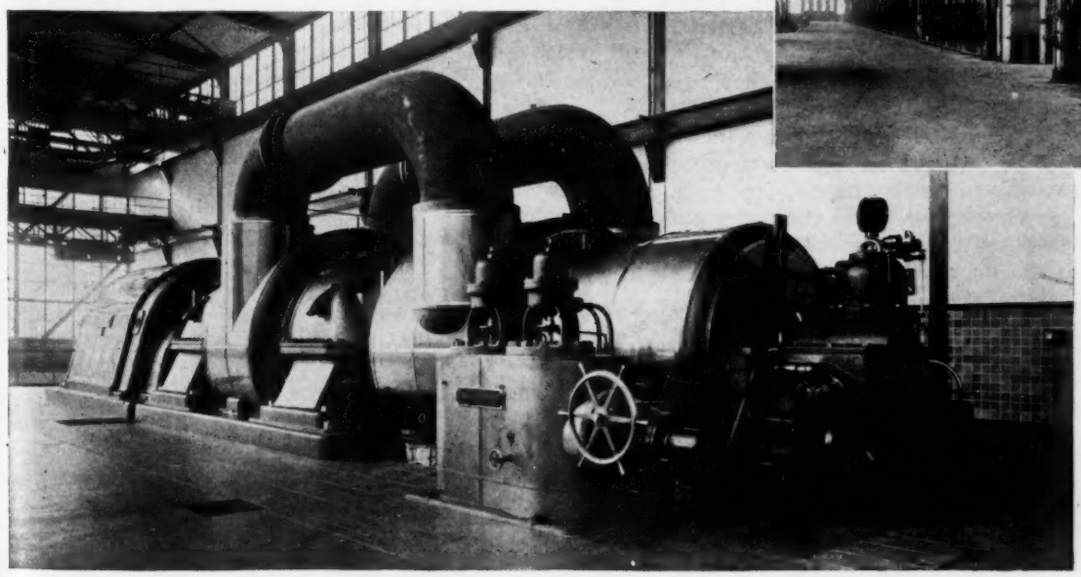
Four 100-kv. two-circuit transmission lines link the Golpa, Lauta and Trattendorf power stations to Berlin, where power is supplied to the municipal system and to the newly electrified city and suburban railroad. West of Golpa is a system owned jointly by the Electric Power Corporation and another utility. At Leipsic interconnection is made with the 100-kv. Saxon Power Corporation system, extending all over highly industrial Saxony. From Trattendorf a 100-kv. line runs East to Tschechnitz, near Breslau, where power is supplied to the Silesian Power Corporation.

The Eastern extension, now under construction, will tie into the upper Silesian system. At Cosel a most modern plant is being built of initially 80,000 kw. capacity to meet the growing demand of the upper Silesian industry.

being enlarged about 250,000 kw. capacity: One 40,000-kw. unit (already in operation); one 40,000-kw. and two 85,000-kw. units being installed and ready for operation by the fall of 1929.

With two smaller units the capacity of the modern section of the plant will amount to 275,000 kw. Ten older units, the original wartime installation, with an additional capacity of 165,000 kw., will serve as spare capapacity. The Trattendorf and Lauta stations have 130,000 kw. capacity each. The whole

Full Automatic Operation Is Feature of Golpa Boiler Room Burning Low-Grade Fuel



Two 40,000-Kw. Turbines and two 80,000-Kw. Units Now Being Installed Are Latest Additions to Golpa Plant

system, accordingly, will have 700,000 kw. installed altogether.

For the increased generating capacity six new boilers, each with 10,764-sq.ft. heating surface, have been added, and eight more of the same size are being installed. Three cooling towers, each of 500,000 cu.ft. capacity, are under construction. Following recent favorable experiences at the Trattendorf station, concrete has been selected as the structural material for these towers.

This power system relies entirely on burning of lignite, which is mined in open cuts close to the power plants and from property mostly owned by the company. From 15,000 to 20,000 tons of this low-grade fuel are burned daily in the three plants of the company. Since sufficient condensing water supply was not available at these locations, construction of cooling towers became imperative.

The total stock of the Electric Power Corporation is owned by the German State, but the management is that of a private corporation. This system of conducting government-owned public utilities developed in Germany after the war and proved a successful compromise between sound business managing principles and socialistic tendencies, frowning upon the exploitation of public utilities by private capital.

According to the December 31, 1928, statement, assets, including plants, mines, accounts, cash and stock holdings, total 189,200,000 marks. Outstanding stock, in the hands of the government, amounts to 60,000,000 marks. Appropriations set aside from income for renewals and replacements are carried at 45,700,000 marks. The American loans figure 52,500,000 marks. Current liabilities and some smaller items constitute the balance of total liabilities. Net operating income for 1928 amounted to 14,400,000 marks; income from holdings came to 2,700,000 marks. Net income after all expenses, interest, taxes, depreciation and renewals totals 5,200,000 marks.

Off-Peak Water Heating*

By R. R. Clark
Consumers Power Company

THE off-peak storage heater has been very successful in some foreign countries. For instance, Zurich, Switzerland, population 200,000, has a total connected load of 220,000 kw., of which 120,000 kw. is heating equipment operating on off-peak, which is approximately 55 per cent of the total. A considerable part of this is made up of domestic water heating, as there are approximately 3,000 heaters installed in the city. The system load factor is approximately 70 per cent, which is extremely high compared to load factors of approximately 45 per cent existing in this country.

The electric water storage heater offers enormous possibilities in this country in that it offers a solution for electric water heating and poor load factor conditions in addition to the following: (1) It permits a rate of 1 cent a kilowatt-hour at a substantial profit. (2) It does not appreciably increase the fixed charges and in many cases the water heater can be used at night with the same equipment that is installed to supply the electric range in the daytime. (3) It is the belief of many utility managers that a more substantial profit can be realized at 1 cent to 1½ cents per kilowatt-hour off-peak than at 2 cents for current available 24 hours a day. (4) The service required by these heaters would be much less than electric refrigerators, washing machines and ironers, in view of the fact that they have no moving parts.

The Consumers Power Company has recently purchased and installed two Swiss off-peak type storage water heaters of 80 and 100 gal. capacity with the thought of conducting experiments on off-peak heaters under actual domestic conditions.

The two sizes are exactly alike in construction and differ only in physical size and capacity. The heater consists essentially of a tank, insulation, heating elements, thermostat and automatic time switch. The heating element consists of six 600-watt units connected in parallel and operating on 240 volts. These units, which are of the immersion cartridge type, are mounted in a circular manner on an 8-in. manhole cover fitted to the side of the tank near the bottom.

Due to the high temperatures carried, approximately 180 deg. F., the thermostat is not affected until enough hot water has collected to force the heated water from the units to remain in contact with the thermostatic tube. The placing of the tube in this position prevents any possibility of the units operating in superheated water or steam. The rest of the equipment which is required for off-peak water heating consists of a clock equipped with adjustable contacts with an automatic power switch. The clocks used on these installations are unusually accurate and require very little attention.

The switch employed is unusual in that it is motor-operated instead of magnetic. This has two very distinct advantages: First, it is absolutely noiseless after completing its cycle of operation, which is not the case with many magnetic switches; second, it does not consume energy when in the closed position, as the motor is energized only momentarily. The contacts are of the quick-break type, which promotes long life. The switch is provided with auxiliary contacts which automatically seal in assuring a positive action and making it unnecessary to provide snap action in the thermostat contacts.

Following are some of the figures which have been obtained thus far:

Month	Gallons	Kw.-Hr.	Gallons per Kw.-Hr.	Gallons per Person per Day	Hours Heating	Load Factor Per Cent
April.....	1,933	578	3.34	16.2	163	22.5
May.....	1,722	521	3.30	13.9	147	20.5

26.5 kw.-hr. to heat 81 gal. in 7¼ hours 96 per cent efficient.

This shows an average consumption of approximately 60 gal. of water per day for four people with variations running from 30 to 75 gal. per day. The 80-gal. tank has never failed to supply the requirements.

There seems to exist a general impression that an off-peak rate necessitates the installation of complicated time switches, devices, etc., and also that it would be necessary for customers to change their mode of living in order to fit in with the use of these heaters. This is not at all true; the time switches are relatively simple, and in proportion to the income received, based on no appreciable increase in fixed charges, are entirely justified.

Investigations are now being conducted, both here and abroad, as to the feasibility of operating such off-peak switches from the generating or substation by superimposed frequency. This would eliminate the use of time switches and place the control of this load in

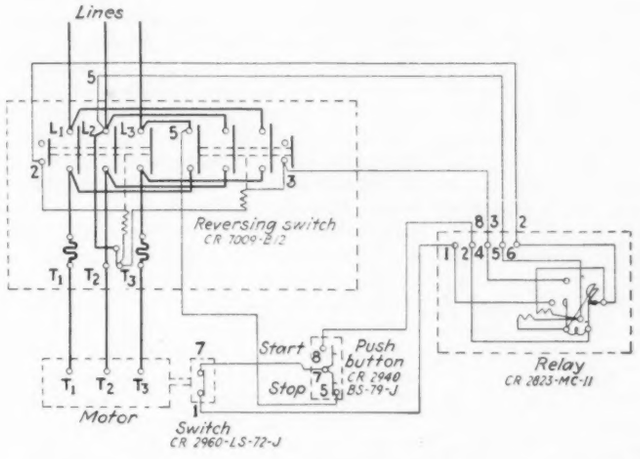
Excerpts from a paper presented by Mr. Clark at a recent meeting of the Michigan Electric Light Association.

the hands of the operators. This would represent an ideal condition and would permit the use of these heaters at any time during the day and night when they could be utilized without interfering with the other load.

Complex Operations Afforded With Standard Control

By R. E. Welton
General Electric Company, Milwaukee, Wis.

AUTOMATIC control of a babbitting machine has eliminated one man in the casting operation and more than doubled the output of the machine for a Milwaukee company which recently installed two 125-lb. babbitt melting pots and centrifugal casting. Before the conversion it was possible to handle about 50 to 75 pieces per hour in the babbitting machine. Now 150 per hour are being turned out without effort. The even heat of the metal and the centrifugal casting have reduced rejections from about 25 per cent to 0.5 per cent.



Control for Centrifugal Babbitting Machines

The babbitting machine consists of a small induction motor with a small air chuck mounted directly on the shaft extension of the motor for clamping the work to be babbitted. The procedure in babbitting is as follows: The piece is properly chucked and is rotated by operating the motor at full speed in the forward direction. Molten metal is poured into the rotating piece and allowed to cool as it is rotated. In order to save time during the cycle of operations the motor is "plugged" to stop after the babbitt has cooled, thus eliminating several seconds of delay while the motor is coming to rest. During the time that the metal is cooling and the motor is stopping it is necessary that the operator tin the next piece which is to be babbitted and make preparations for the second operation. To eliminate the extra man necessary for this work the whole operation has been made automatic after pressing the "start" button and pouring in the metal. The accompanying swetch indicates the interconnection of the several pieces of standard control used in this equipment.

The motor is started in the forward direction and plugged to the reversed direction for stopping by means of a standard reversing switch. In order to obtain automatic control of the length of time the motor is in operation the relay is used to start the motor in the forward direction and then, after a predetermined lapse of time, to plug the motor in the reverse direction. The other switch is used to open the circuit to the motor after it has attempted to reverse.

This equipment has eliminated one man in the casting operation and has more than doubled the output of a babbitting machine. It was possible to obtain about 50 to 75 pieces per hour from such a machine, but this equipment is producing 150 per hour without special effort. The even heat of the metal and the centrifugal method of casting have reduced rejections from about 25 per cent to about five-tenths of 1 per cent.

Letters from Our Readers

Substation Grounding

To the Editor of the Electrical World:

In the writer's article on "Substation Grounding" which appeared in the July 27, 1929, issue of Electrical World, page 173, attention is called to a note in Fig. 2 which might be misconstrued. A note in this figure states that the sheath should be grounded approximately every 50 ft. of cable run. The sheath referred to is flameproof asbestos covering and not lead, as might be supposed.

F. H. Mayer,
Department of Engineering Design.
Southern California Edison Company,
Los Angeles, Calif.

Thinks Editorial on Resuscitation Timely

To the Editor of the Electrical World:

My attention has recently been called to the editorial "Who Rules—Lineman, Policeman, or Interne?" in the July 27 issue of the Electrical World, and I wish to express my sincere appreciation of the favor that you have done the entire public utility industry in your able presentation of this problem.

The need for the services of highly trained prone-pressure resuscitation crews is growing broader every day. Workers in practically every industry are exposed nowadays to the danger of electric shock. Exposure to various types of gas poisoning occurs in numerous industries, and in a great many private garages, and kitchens. The newspapers are telling us every day at this time of the year of cases of drowning, in some of which rescues have been effected by means of the prone-pressure method, while in numerous other cases lives might have been saved had the services of a prone-pressure crew been available.

For the protection of their own employees the public utilities throughout the country are training them in the application of prone-pressure treatment, and, as a matter of public service, the utilities stand ready to offer the assistance of these trained employees whenever they can help to bring back to life a victim of electric shock, poison by illuminating gas, carbon monoxide or other poisonous gas, or drowning. It is not their desire to replace the doctor, but it is their idea to place at the disposal of the doctor a valuable technique in the saving of human life, which members of the medical fraternity do not have an opportunity to develop, and which, in any event, cannot be carried out by one man.

Gordon Wilson,
Director of Safety.
The Management & Engineering Corporation,
Chicago, Ill.

Digest of Electrical Literature

Generation, Control, Switching and Protection

Small Automatic Plant in Rockies Serves Silver Mines.—F. J. BARTHOLOMEW. — Hydro-electric generating plants furnishing power to mines in British Columbia must operate under extraordinary conditions in so far as water supply and the use of energy at various seasons and times of day are concerned. This requires special provisions for generating equipment and control apparatus and likewise involves the consideration of unusual elements in the selection of equipment. A high-speed waterwheel with automatic features reduced to a minimum to secure the most economical operation includes automatic voltage regulation with compounding load compensation; automatic shutdown of the machine for runaway at 10 per cent overspeed, for overheating of any of the five bearings, or for insulation failure and automatic oil switch and field switch opening upon external faults, overload, insulation failures, or excessive temperature rise of the alternator. Provision is also made for the control of the waterwheel from the mill, 1½ miles away; automatic charging of the storage battery and battery conditions to be capable of being checked by indicating instruments at the mill at all times.—*Electrical News and Engineering (Canada)* August 15, 1929.

Transmission, Substations and Distribution

Modern Oil-Purifying Equipment.—Each of the thirteen substations to be constructed in connection with the Central Scotland electricity supply scheme will be equipped with a new type of oil-purifying equipment following a "stream-line" principle. This differs entirely from the centrifuge and the blotter press in that it is a simple static plant requiring very little attention, which is cleaned when necessary by the simple opening of appropriate valves providing for a reverse flow of compressed air. The equipment consists of a preheater and a vacuum receiver from which dry clean oil is removed by a wet vacuum pump and air by a dry vacuum pump. In the preheater the oil is raised to a temperature of 80 deg. C., thermostatic control preventing excessive heating, and the oil then passes into the filter. The filter consists of 91 columns, 3 ft. long, of washers 1⅛ in. in diameter mounted on square rods located at the top in a special division plate. The washers are of a specially prepared paper and are spring loaded, so as to maintain a suitable compression. When filtering, liquid passes from the container around the columns, between the paper washers and up the central clearance into the filter head, the space above the division plate receiving only clean oil. Every trace of solid impurity, however, finely divided, it is claimed, is held back at the edges of the paper washers, building up in time a uniform layer over the whole surface of the columns. Results are said to be of a highly satisfactory character.—*Electrical Review (England)*, August 16, 1929.

Motors and Control

Electrically Driven Rope Spinning Machine.—H. WILBERT.—While modern, automatic machines are producing today all small size hemp ropes, the old-fashioned method of long rope galleries is still in vogue for heavy and heaviest hawsers, used extensively on shipping vessels. The former rope transmission drive has, however, been replaced by the much more economical and convenient direct electric motor drive, details and requirements of which are very little known. The present paper is a complete account of the characteristics of this unique branch of motor application, which is a surprisingly involved combination of a stationary and a traveling motor of proper correlated speed. A very serious handicap of such a drive is the very wide range of speed regulation, necessary for various types and sizes of hawsers, exceeding frequently a range of 1:20. A combination of electric regulation and mechanical gear shift is unavoidable. Curve diagrams are given to show the influence of rope spinning speed upon best suited motor speed, and power requirement of the machine. Control wiring of the motors is given for d.c. and three-phase drive. The over-all efficiency of the old rope transmission drive never exceeded 50 per cent, while individual electric motor drive will reach readily 80 per cent. The possibility of higher speed in the latter case increases materially the output of the machine.—*Siemens Zeitschrift*, July, 1929.

Electrophysics, Electrochemistry and Batteries

Direct-Current Voltage Distribution in Solid Dielectrics. — P. BONING. — Application of the electron theory to dielectrics indicates theoretically that up to a certain maximum voltage the potential drops through the thickness of the insulating material according to a linear law; beyond that voltage, however, the law becomes essentially parabolic, and gives rise to a rather irregular internal voltage distribution. Employing a specially devised instrument combination of two static voltmeters and a test condenser, the author was able to verify these theoretical conclusions by laboratory tests on hard rubber, fiber and Pertinax, in thicknesses of 10 to 15 mm. Small grooves were turned into each cylindrical test disk, to allow the introduction of test wires for measuring the potential in five equidistant heights along the thickness of the disk.—*Elektrotechnik und Maschinenbau*, July 21, 1929.

Miscellaneous

Current Passage Through the Human Body.—Much evidence, partly contradictory, has been accumulated as to the danger of current flow through the human body. Certain minimum voltages have been called harmless, since no physiological actions upon human sensitive organs were observed under ordinary circumstances. In view of the lack of reliable and systematic data, the Swiss Electrotechnical Society instigated a large series of tests on 25 male and female volunteers. Tests were made with 50 cycle a.c. and with d.c., introducing a number of variations, such as contact surface, skin condition (dry or wet), and current path (hand to hand, hand to foot). The results were tabulated and plotted as curves, and present probably the most complete information on the subject yet published. It seems that 1 milliampere passing from hand to hand through electrodes 1 in. diameter and 8 in. long is the lowest current which can generally be felt; 4 to 5 milliamperes cause the first pain, while 15 milliamperes locks the hands (all a.c.). Up to 30 milliamperes has been withstood, but caused almost unconsciousness. As low as 1,500 ohms resistance from hand to hand is not unusual, which brings the danger zone to as low as 30 volts (a.c.). For a person in a bath 10 volts becomes dangerous. For d.c. 10 milliamperes has been found to be highly dangerous.—*Bulletin de l'Association Suisse des Electriciens*, July 7, 1929.

Radiology, X-Ray Intensity and Absorption.—A portion of the report of the National Physical Laboratory which has been devoted to the general subject of X-ray phenomena and the establishment of international units for investigation is mentioned in this discussion and the industrial use of X-rays in the analyses of tungsten and tungsten-silicon steels, with particular reference to the relation between magnetic and other properties, has been considered. This article also refers to the work of the electricity department and covers the following topics: Electrical standards and measurements, valve impedance, dielectrics, magnetometers, hysteresis, and directive antenna relationships in wireless telegraphy. — *Engineering (England)*, August 9, 1929.

News of the Industry

Secretary Good Predicts New Power Board

Head of War Department Says that Cabinet Members Cannot Give the Time to Water-Power Affairs that Their Importance Demands

By Paul Wooton
Washington Correspondent for the Electrical World

SO IMPORTANT are the problems coming before the Federal Power Commission, said J. W. Good, Secretary of War, on September 4, that Congress in the near future will be obliged to set up an organization that is not only impressed by the responsibility incurred in administration of the federal water-power act, but which has the time to devote to the increasing amount of work. "I am sure," Secretary Good said, "that some action of that sort will be necessary. The three members of the Cabinet who now compose the commission cannot give the time to it that the importance of the matter demands."

Secretary Good said that as an individual member of the commission he had no objection to the fullest investigation by Congress, such as that proposed by Senator Couzens, concerning the commission's activities. "In view of the controversy that has arisen concerning the commission's procedure," Secretary Good observed, "such an investigation might lead to a better administration of the law. The members of the commission can give very little time to it, and it would be a good thing for the executives in charge to know that Congress is interested."

With reference to relieving the Cabinet members ot their duties as members of the commission—by the creation, presumably, of an independent organization—Secretary Good said that approving applications for licenses is "a pretty big problem to deal with." In predicting that its importance will actuate Congress to create a permanent organization, Mr. Good explained that he was expressing his own personal views and was not speaking for the commission.

Colorado Basin Executives Confer on Boulder Dam

Governors from three and Colorado River commissioners from all seven states of the Colorado River basin met at Salt Lake City on August 28 to confer again on questions bound up with the development of that river and the building of Boulder Dam. On motion of Governor Emerson of Wyoming, the conference voted that the Secretary of the Interior be asked to consider, in addition to the actual cost of the power, various other factors, and especially those provisions of the Boulder Canyon project act which require that any surplus from the sale of power after the dam cost is repaid to the government shall be devoted to the development of the entire river in accord with a comprehensive plan.

The four upper basin States—Utah, Colorado, Wyoming and New Mexico—voted to ask for the continuance of a Federal Power Commission embargo on applications for permits and licenses for power plants on the Colorado River and its tributaries.

California representatives declared that, far from the Boulder Dam providing a subsidy to southern California, it appeared now as if California would have to subsidize the dam by paying more for power from that source than its real market value.

Representatives of the four upper basin states have agreed to meet in Denver on November 5 and try to agree on the allocation of the 7,500,000 acre-feet of water granted them from the Colorado River as their share.

Interstate Utilities and Federal Control

State Commissioners Condemn Couzens Bill—Free Discussion of United States Court Decisions, Reproduction-Cost Theory and Regulation of Holding Companies

FEDERAL encroachment on state rights was the main subject discussed during the forty-first annual convention of the National Association of Railroad and Utilities Commissioners. Meeting August 27 to 30 at Glacier National Park, Montana, regulatory authorities from 35 states resolved to oppose all federal legislation that would deprive the states of their present powers. They went on record particularly in opposition to the bill now before Congress providing for a new federal commission to control electric power, radio and telephone companies engaged in interstate transmission.

Governor Reed of Kansas said in a formal address that state regulation was on trial, largely because of the interference by federal courts with state control of taxation and regulation. According to him their interpretation of the due-process and equal-protection clauses of the Constitution had led to a revolution in our form of government. Not the courts but federal legislation was blamed by James S. Benn of the Pennsylvania Public Service Commission for the loss of power formerly exercised by the states.

Stating that no one was more concerned with the success of regulation than the utility companies, George R. Lunn, New York Public Service Commission, appealed for their co-operation. There should be more efforts to present facts to the commissions and less running to the federal courts for help, he declared. Mr. Lunn predicted that the theory of reproduction cost new, which he said was the only way to justify claims of confiscation, would come back to mock those who upheld it.

The best method of stopping federal encroachments, urged Clarence Gilmore, Texas Railroad Commission, was for each state regulatory body to perform its duties faithfully and conscientiously.

Holding companies came in for extended comment. Their economic value was upheld in an address by Carl D. Jackson, counsel for the National Electric Light Association and the American Gas Association, and in round-table discussion by William Hagenah of the Byllesby Engineering & Management Company, Chicago. The commissioners' opinions varied. Mr. Benn of Pennsylvania and a few others asserted that the holding companies could be adequately controlled through the authority over rates now had by the state commissions. Most state commissions can regulate holding companies, according to a report submitted by the committee on intercorporate relations, by disregarding the corporate fiction and regarding holding and operating companies as one and the same. The committee, of which John F. Shaughnessy of Nevada was chairman, advised that where necessary the powers of commissions over holding companies should be broadened by appropriate state legislation.

Many speakers emphasized the difficulties of regulating holding companies located outside their states. Hugh White, chairman Alabama Public Service Commission, summed up this point of view when he said that holding companies should be under the state commissions if injury and havoc were not to follow to operating companies.

After a few objections had been entered, the association voted to support one so-called Couzens bill, formerly the Parker bill, to regulate interstate bus operation by a national law. The resolutions adopted concerning the Couzens bill to regulate interstate communication and transmission of

energy by the creation of a federal commission and concerning the general principle of federal regulation follow:

Resolved, That this association is unalterably opposed to United States Senate bill No. 6 and its amendments, or to any enlargement of federal authority by the creation of new agencies or the enlargement of the authority of present agencies whereby the regulatory authority of the state commissions would be interfered with in a field where they are now adequately functioning.

Resolved, That, whereas under the principle established by the decision of the United States Supreme Court in Pennsylvania Gas Company vs. Public Service Commission (252 U. S. 23), state authorities, in the absence of federal legislation, retain power to regulate local service of utilities which operate across state lines, including the rates for such service, this association asks Congress not to interfere with the continued exercise of that power as to any class of public utilities by legislation vesting power to regulate such service and rates in any federal tribunal.

The newspaper viewpoint of regulation was outlined by M. A. Wolff of the Newark *Evening News*, Newark, N. J. He said that, if regulation is to succeed, the great need is a better informed and more enlightened public opinion. To accomplish this, Mr. Wolff said, the commissions should help the newspapers to popularize the subject. He was hopeful of the future if the public was informed, in spite of certain court decisions which, he said, have weakened the public faith in the practical value of regulation.

Other events of the convention were an illustrated lecture on the development of animal and power locomotion by E. I. Lewis, chairman Interstate Commerce Commission; a paper by President Ralph Budd of the Great Northern Railway on the "Problems of Railroad Construction and Operation in the Rocky Mountains," and an address on the "Time-Saving Aspects of Air Transportation," by Major-General John F. O'Ryan of Colonial Airways, New York.

Officers elected for the coming year were: President, Charles Webster, Iowa Board of Railroad Commissioners; first vice-president, Harvey A. Hannah, Tennessee Railroad and Public Utilities Commission; second vice-president, J. J. Murphy, South Dakota Board of Railroad Commissioners; secretary (re-elected), James B. Walker, secretary New York Transit Commission.

The 1930 convention will be held November 12 to 15 at Charleston, S. C.

Santa Monica Draws Institute Members

First Day's Sessions Devoted to Radio Interference, Spray and Fog Tests on 220-Kv. Insulators, 60-Cycle Flashover and Wooden-Pole Lines

PROVIDED with a well-rounded technical and entertainment program, more than two hundred members and guests of the American Institute of Electrical Engineers met this week at Santa Monica, Calif., for the annual Pacific Coast convention of that body. In a brief address at the opening session on Tuesday morning, President Harold B. Smith said that those who attend Institute meetings are gathered to contribute to the work of the electrical engineer and that meetings of the kind should be an inspiration and prove a stimulus to the men who are privileged to attend.

Causes of radio interference from pin-type and suspension insulators and remedial measures were discussed in a paper by Ellis Van Atta and E. L. White. Metal-coated or metal-capped heads, metallic threads in pinholes or a special glaze on the head and in the pinhole are among the remedies suggested for pin-type insulators. Suspension insulators can be improved by changing the design of the cotter key in the clevis type and by redesigning arcing horns to eliminate discharges at the ends. With existing pin-type insulators copper mesh placed under the tie wires has proved successful in eliminating discharges.

Discussion brought out the fact that ratio of broadcast signal strength to intensity of line noise is one of the determining factors in radio interference; also that the practice of over-insulating many lines has made them immune from causing trouble.

Results of tests conducted on ten different types of insulators at 150 kv. to ground in presence of sea fog over a period of two and one-half years were presented by R. J. C. Wood. Surface leakage resistance was found to be a fair index to the resistance to arcover, the shape of the insulator having no bearing as long as the total surface resistance of the string remained the same. Suspension strings having a total surface resistance of eleven (in inch units) per string appear sufficient for a steady voltage of 150 kv. to ground under sea fog conditions. (Surface resistance, it was explained, is not measured resistance, but is the calculated surface leakage resistance from cap to pin of a single insulator unit, assuming the exposed porcelain surface to be uniformly coated with a non-conducting layer having a resistance of one megohm per square inch.)

It was brought out in discussion that if insulator supports be washed periodically a smaller number of units may be used. At the Long Beach steam plant of the Southern California Edison Company insulator supports on the 220-kv. bus are washed each day with fresh-water spray and have operated without flashover for more than a year.

Research at Stanford University to determine the 60-cycle flashover of long suspension insulator strings, recounted by R. H. Angus, showed that the point-to-plane arcover distance is the closest approach to the value that should determine tower clearances. All strings should be shielded. The lowest flashover arc is obtained with strain strings, which need be no more than 5 per cent longer than suspension strings, while double strings have the same flashover as single strings of the same length if both are adequately shielded.

A series of tests on the impulse insulation characteristics of wooden poles and cross-arms in transmission-line practice were discussed in a paper by H. L. Melvin. Although there is a limitation to the insulating value of poles and cross-arms against impulse voltages, nevertheless the insulating properties of wood are proving effective in mitigating damage from lightning disturbances on a number of lines now under observation. Use of wood, however, does not result in a reduction of the amount of porcelain required on account of the probability of cross-arm and pole fires. Wet wood has also a low insulating value against steadily applied voltage, but does not alter impulse insulation characteristics.

The author expressed the desirability of further field experience to prove the conclusiveness of the experimental data presented.

Wednesday was given over to trips and pleasure. Technical sessions on Thursday afternoon and Friday, with a banquet Thursday night and visits of inspection, were to conclude the convention.

Maine to Vote on Power Export Bill on Tuesday

Next Tuesday, September 9, the voters of Maine go to the polls to approve or disapprove the measure permitting the exportation of surplus electrical energy, which has hitherto been forbidden by the Fernald law. The Smith-Carleton measure, now before the people for ratification, imposes a 4 per cent excise tax on the gross revenue from the sale of energy exported. Transmission companies may by its terms be organized for the purchase, transmission and sale of power not needed in the state. This can be purchased only from generating companies holding permits from the Public Utilities Commission to sell such energy. The transmission companies are not to be permitted to generate electricity themselves.

The Central Maine Power Corporation has led the fight for ratification, maintaining that large plants bring low cost to consumers and that the right to export is a prerequisite to the building of large plants. Opponents of the measure point to the establishment of industries in the Province of Quebec consequent upon that province's prohibition of the exportation of power. To this advocates of power exportation reply that the respective situations are not comparable and that Quebec has the advantage

of raw materials which Maine does not possess, cheaper labor supply and the tendency of American industries to establish branch plants across the Canadian boundary in order not to be handicapped by the Canadian tariff.

Beaver River Development Is Now Complete

The Moshier power development, about 25 miles from Lowville, N. Y., final link in the 65,000-hp. hydro-electric project of the Northeastern Power Corportation on the Beaver River, was completed about the last of August, according to W. P. Creager, vice-president and chief engineer of the Power Corporation of New York, a subsidiary of the Northeastern. The initial capacity of the Moshier plant will be 12,000 hp., with a possible ultimate installation of 24,000 hp.

The Moshier plant is the last of eight hydro-electric plants below the Stillwater reservoir, utilizing a head of 820 ft., and its energy will be fed into the Northeastern Power system. The dam is two miles above the power house, with a width of 20 ft. at the top at an elevation of 1,650 ft. above mean sea level. It has a total length of 1,130 ft., including the concrete spillway; a maximum head of 90 ft. and a maximum base of 440 ft. The spillway is 200 ft. long and at the north end of the dam. A wooden-stave penstock conveys the water to the power house, which is built of tapestry brick and belted with precast concrete.

The major items of equipment in the power house are two S. Morgan Smith 5,900-hp. vertical turbines directly connected to two 5,000-kva., 60-cycle, 6,000-volt General Electric generators. The voltage will be stepped up to 110,000 by three 3,333-kva. outdoor oil-cooled transformers. A new 110-kv. transmission line will run from the plant to the Soft Maple plant, six miles north, and there connect with the Northern New York Utilities system. Stillwater reservoir, which was enlarged in 1924, now has an area of 6,700 acres and provides a minimum flow of about 356 sec.-ft. at Moshier.

New 30,000-Kw. Unit Starts at Parr Shoals Station

A second 30,000-kw. turbo-generator at the Parr Shoals steam-electric station, near Columbia, S. C., has been tested and put into operation by the Broad River Power Company, which is now a part of the Associated Gas & Electric Company's system. The completion of this unit gives to the station a total capacity of 72,500 kw. Work on the third unit was started last fall by engineers of W. S. Barstow & Company and was completed on schedule time, a special effort having been made to get it in operation before the dry period.

The Broad River Power Company entered central South Carolina in 1924, when the site at Parr Shoals was selected for a steam station to supplement the hydro-electric service upon which the region had previously depended entirely. In thirteen months the first unit of 12,500 kw. was in operation and in August, 1926, machinery capable of generating 30,000 kw. more was set in motion. The steam station has already pulled its territory through two extremely dry periods. Since the installation of the second unit industries served by the Broad River Power Company have never had to curtail their operations.

Mohawk-Hudson's Steam Reserves Meet Drought

Continued drought in the central and upstate section of New York is causing serious inconveniences to power corporations. Announcement was made on September 3 by George A. Powell, acting head of the power control department of the Mohawk-Hudson Power Corporation, that because of low-water conditions at its hydro plants virtually one-half of its power requirements are being generated by steam. The normal daily output of 125,000 kw.-hr. at the state-owned plants at Vischer's Ferry has dropped to 50,000 kw.-hr. or 60,000 kw.-hr.

"The continued lack of rainfall has created the lowest stream flow at this season for some years past," Mr. Powell asserted, "and clearly demonstrates the necessity of having large steam generating units in reserve to meet these conditions." During the last month the hydro-electric stations have depended largely on water drawn from the company's storage reservoirs, which were filled during the heavy rainfalls in the spring, he said. This storage has been drawn on for the past six weeks, and nearly one-half of the water has already been used.

The Amsterdam steam station has been operated during the last few months and has gradually picked up a large amount of the load, especially during the heavy demand on weekdays. At the present time steam stations are carrying 75,000 hp., as against 100,000 hp. supplied by the hydro stations. With the continued drought, this proportion will be increased. All three major steam reserve stations of the system are now in operation. These are the Amsterdam station, rated at 75,000 kva.; the Harbor Point station at Utica, 37,500 kva., and the Riverside station, Albany, 37,500 kva.

Interconnection in Arizona Prevents Power Shortage

The possibility of a power shortage in the area served by the Salt River Valley Water Users' Association in Arizona, owing to a shortage of power supply at the association's hydro-electric plants on the Salt River and a demand for additional power from cotton gins in the valley, was overcome recently by an interchange of power between the Central Arizona Light & Power Company, the United Verde Mining Company and the Arizona Power Company.

The Salt River Valley Water Users' Association is under contract to deliver 9,000 kw. of electrical energy to the Central Arizona Light & Power Company, which serves a district comprising Phoenix and surrounding territory, but to enable the Water Users' association to divert sufficient power to meet the demand for irrigation pumping and to operate valley cotton gins it was obviously necessary that the Central Arizona Light & Power Company obtain power from some other source.

The Central Arizona Light & Power Company also has contracts with the Arizona Power Company at Tapco for the delivery of a certain amount of power to Phoenix, which is delivered over the power company's 75-mile transmission line, and by working in cooperation with the Arizona Power Company and the United Verde Mining Company an additional supply of about 3,000 hp. was obtained for Phoenix. It was found that this additional supply of 3,000 hp. was sufficient to relieve the Water Users' association of the necessity of supplying any large amount of power to Phoenix, enabling the association to employ all its power resources for the operation of irrigation pumps of the Salt River Valley and surrounding territory. All surplus power above the needs of the Central Arizona Light & Power Company is being delivered to the Water Users' association. The conservation of electrical energy in the Phoenix district, which was for the purpose of assuring the farmers an adequate supply for harvesting of crops, was found to be unnecessary after a four-day duration.

Hartford Electric Light Again Shares Its Profits

Following the precedents set by it in former years, the Hartford Electric Light Company has announced that it will again share its profits with customers, employees and stockholders. Customers will be rebated 60 per cent of their October bills, employees will receive as extra compensation 60 per cent of their October wages, and stockholders as of October 20 will get, as an extra dividend, 60 per cent of their October dividend accrual.

The total extra payments this year will be about $536,000, as compared with $495,000, on the same basis, last year. This year's largest item will be $350,000 to customers, who are advised in a letter from the company that "the results of this year can be duplicated and improved only by continued efforts on the part of the company to make electricity abundantly available to all at low prices and on the part of the public by their willingness to increase their use of our product in every way that is advantageously possible."

Purchases and Mergers

Still Another Offer for Radford (Va.) Municipal Plant—Eastern Kentucky Utilities Company Sells Various Plants to Byllesby Interests

FOLLOWING the overwhelming defeat reported last week of the offer of $400,500 by the Republic Service Corporation of Coatesville, Pa., for the municipal electric franchise of Radford, Va., a tentative offer of $600,000 has been made. This offer, said to be from a Chicago company, is under consideration by the City Council. Radford's electrical property includes a water-power site on the Little River, and many citizens are convinced that it is worth $1,000,000.

The town of Lattimore, N. C., will vote September 26 to decide whether to accept an offer of $18,000 made by the Southern Public Utilities Company for the Lattimore electric plant. This company has recently taken over the electric distribution systems at Catawba and Valdese, N. C. The distribution system at Catawba had formerly been operated by the municipality; the system at Valdese was purchased from private owners.

Officials of the Eastern Kentucky Utilities Company announce the sale of a number of power, light, gas, ice and water properties in Kentucky and West Virginia to the Byllesby interests of Chicago, which will probably put them under control of the Standard Gas & Electric Corporation, it is said. Included are the Salyersville Gas, Electric & Ice Company, the West Liberty Electric & Gas Company and the Louisa Light & Power Company.

A temporary restraining order to prevent the sale of the Union Traction Company of Indiana to the Insull interests (ELECTRICAL WORLD for August 31, page 440) has been issued in Circuit Court in Indianapolis.

The Northern New York Utilities, Inc., has taken over the electric power and light system in the towns of Northwestern and Westernville, N. Y., formerly owned and operated by Charles Pillmore.

Authority has been granted by the New York Public Service Commission to the Silver Creek (N. Y.) Electric Company, which operates in Silver Creek, Perrysburg and Forestville and the towns of Hanover and Perrysburg, to transfer its property to the New York State Electric Corporation.

Certificates have been filed in the office of the Secretary of State at Albany, N. Y., under the terms of which the Empire Gas & Electric Company of Geneva absorbs the Marcellus Lighting Company and the Jordan Electric Light & Power Company.

Announcement is made by W. N. Clark, vice-president Southern Colorado Power Company, of the purchase of the Custer County Electric Company, serving Westcliffe, Colo., and adjacent territory.

Ohio Utilities Change Hands

Transfer of the properties of the Ohio Utilities Company, Columbus, and the Chillicothe Electric Railroad, Light & Power Company to the Southern Ohio Electric Company, mention of which sale was made in the August 24 issue of the ELECTRICAL WORLD (page 395), is expected to be consummated about October 1. Immediately thereafter headquarters of the Southern Ohio Electric Company will be transferred from Athens to Columbus, and the united properties will be operated from a central office under J. B. Poston, general manager.

The Ohio Utilities Company provides electric service in Delaware, Circleville, Gallipolis, Hillsboro and several small communities. The Chillicothe Electric Railroad, Light & Power Company furnishes electric service at Chillicothe. The Southern Ohio Electric Company operates a central power station at Floodwood, furnishing electric service in Athens, Nelsonville, Middleport, Jackson and a score of smaller communities in addition to providing power for the Hocking Valley mining field.

Gatineau Power Supplies 50,000 Hp. More

The Gatineau Power Company has begun the delivery of an additional 50,000 hp. to the Hydro-Electric Power Commission of Ontario. This quantity of power, originally scheduled for delivery on October 1, increases to nearly 130,000 hp. the total energy now being delivered by the Gatineau Power Company to the commission.

About October 15 the Gatineau company will deliver a further 20,000 hp. to the commission, raising the total deliveries to 150,000 hp. and anticipating by nearly a year the quantity scheduled under contract for delivery October 1, 1930.

Governor Roosevelt on "Equal Service"

New York State Executive Wants Customers, Irrespective of Their Location, to Have More Nearly Uniform Electric Rates and Charges

ENTHUSIASM was evoked, reporters say, by remarks of Governor Franklin D. Roosevelt of New York made at the state fair at Syracuse last week on the subject of utility rates, charges and mergers. Part of the Governor's observations on these subjects related to telephone charges. He thought that these should, like the mileage charge on railroads, be so regulated as to be uniform over the state irrespective of the location of the customers served. He favored the same principle for electric light and power rates and charges for installation, saying:

The other example, and one which is even more glaring in its unfairness, is that of the use of electricity in the homes. The railroad principle of fairly uniform rates has been thrown to the winds even by the public regulating body known as the Public Service Commission.

Is it not time to stop and ask the question: "Why does electricity in the home—the electric lights, electric refrigerator, electric sewing machine, the home machinery—costs as high as from 15 to 20 cents per kilowatt-hour in some localities and as low as from 4 to 6 cents per kilowatt-hour in other localities?" Why should families in one section be so grossly penalized over families in another section?

This difference in charges is true not merely in its application to regions as large as counties, but is true in respect to towns adjoining each other and houses separated only by a mile or two. This is perhaps one reason why even today nearly two-thirds of all the farmhouses in the State of New York have no electricity. I am wondering whether it is not time for the people of this state to ask for the application of a more uniform rate and a more uniform system of charging for installation.

Coming to the matter of mergers, the Governor said:

Very recently the greater part of all the electric companies in the State of New York were merged into three holding companies, and within the past few months these three great holding companies have been merged into one colossal holding company. That holding company controls today over three-quarters of the state area.

The first question to ask is whether the savings which have been promised in management and in overhead by the merger will be translated into four practical results—first, better service; second, cheaper and more uniform installation cost; third, definitely and materially lower rates for the use of the electricity in the homes, and finally a complete reorganization and simplification of the most complicated and impossible series of contracts between householders and the company which the legal profession has invented in all its history.

I am not going to touch upon the legality of these mergers at this time, but I am asking the very definite question: "How long will it be before these material benefits to the householder in the State of New York will become accomplished facts?"

New York Executive Sends a Questionnaire on Energy

Governor Roosevelt is receiving information relative to electric light and power in various municipalities in New York in response to a questionnaire which he has sent to the mayor or president of each city and village. The Governor would like to ascertain the extent to which municipal bodies and institutions throughout the state are consumers of light and power. His questions are:

Does your city contract for or purchase (a) electric light, (b) power?

What is your annual consumption in kilowatt-hours of (a) light, (b) power?

Do you purchase by contract or do you pay on a meter system?

If you purchase by contract, will you annex copies of your existing contracts?

Do you expect that your necessary consumption of light and power will be increased?

If so, to what extent?

Is there any real competition in bidding for your service?

How many companies in your section could sell you light or power?

N.E.L.A. Reports on Water Power and Electrification

In a report on the progress of water-power development in 1928, just issued, the water-power development committee of the National Electric Light Association sets forth concisely the views of the power industry with respect to a national policy on water power. Discussing the outstanding principles which should form the basis for such a policy, the committee says:

Water-power resources should be developed to the fullest extent and in the shortest time possible under the economic conditions that prevail. The greatest benefits from the large water-power developments of the country, such as the St. Lawrence, Tennessee, Columbia, etc., will be the growth and general prosperity of the adjacent territory which will be due to the industrial growth that naturally follows these developments.

In general, the greatest utilization can be secured for water-power developments when they are part of large utility systems. This is specially true if there are other uses of the water, such as irrigation, navigation and flood control, all of which result in variable rates of output whose inequalities can usually be tolerated in or absorbed by a large interconnected system of steam and water-power plants.

Special charges or taxes assessed against water-power development by federal or state governments limit the extent to which water power can be used to foster industrial development; consequently such charges should not be imposed.

Regulation by public agency should be provided (as it now is in practically every state) to secure proper service at fair rates to all consumers.

The federal water-power act in its present form can be administered so as to promote the development of all water power for which a market exists, and it provides ample safeguards for the public interest. Water powers for which no market exists should be withheld from development until economic conditions warrant their use.

The tendency to exempt from the jurisdiction of the Federal Power Commission any projects over which the federal government has jurisdiction is unsound and leads to undesirable delay and inefficiency in the development of feasible water powers.

In an elaborate report just issued the N.E.L.A. committee on the electrification of steam railroads, after reviewing the major projects throughout the world, summarizes the immediate factors which have influenced various railroad systems to proceed with electrification. These are:

1. The greater economy of electric traction as compared with steam operation in dense traffic territories.
2. The growth of the Southern passenger business.
3. The increasing density of both freight and passenger business on Eastern lines and the probability that in the future more rapid movement will be required.
4. The desirability of utilizing the advantages of electric traction in connection with the construction of new passenger terminals at Philadelphia and Newark.
5. The desirability of building a locomotive that will meet the requirements from the standpoint of weight of train, speed and reliability that will have to be met in this territory in the next twenty years.
6. The probability that the project, if started now, could be completed with a less total expenditure, all matters considered, than if started at a later date.

Denver Water Commissioners Plan for Power Plants

Issuance of a preliminary permit by the Federal Power Commission to the city and county of Denver covering a 79,000-hp. project at the Two Forks dam site on the South Platte River is believed to be the first step on the part of Denver's water commissioners to launch that city into the power business.

The Two Forks organization, according to Malcolm Lindsey, attorney for the commissioners, merely gives three years' time for exploratory work and contemplation of development possibilities. A further permit, involving water rights and a dam site at Eleven-Mile Canyon, will be applied for as soon as surveys now being made are completed. Eleven-Mile Canyon is near Lake George, Colo., and nearer the headwaters of the Platte than Cheeseman Reservoir, the present principal source of Denver's water supply.

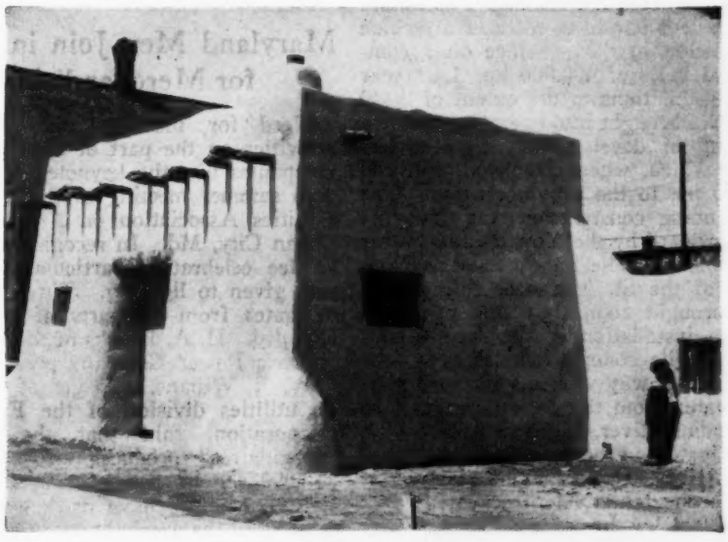
Cheeseman Lake has a capacity of 80.000 acre-ft., which is not regarded as a sufficient impoundage to insure Denver an adequate water system ten years hence. The Two Forks and Eleven-Mile projects are designed, according to the commissioners, to conserve flood waters at sporadic intervals and add about 40,000 acre-ft. to the city's reserve. Present plans contemplate the construction of three reservoirs with six power plants, two at each location, to develop a total of 59,250 kw. Sale of this energy has been urged as a means to retire outstanding water bonds and furnish the city and county of Denver with permanent revenue.

German 220-Kv. Transmission Line to Be Extended

The Cologne-Rheinau (Mannheim) section of the 220-kv. overhead transmission line built in 1926 by the Rheinisch - Westfalische Elektricitäts-Werk of Essen has up to the present been operated at 110 kv. Work is now in progress to extend the line as far as the Vorarlberg and at the same time to operate it at 220 kv. The line is to be completed in 1930. The contract for the complete equipment for seven transformer stations for 220/110 kv. has been placed and the stations are to be of the outdoor type.

The 60,000-kva. transformers are arranged for compressed-air circulation of the cooling oil. The weight of each transformer, without cooling apparatus, is about 180 tons. Since the neutral point of the 220 kv., in contrast with American and Japanese practice, will not be earthed, the insulation must be provided for the full 220 kv.

Indian Architecture for Denver Substation



IN PROCESS of construction at Twenty-first and Lawrence Streets, Denver, the new Barker substation of the Public Service Company of Colorado presents the novel architectural idea shown above. This substation was designed by D. J. Ryan of the Public Service Company's engineering staff, following studies of Indian pueblos in New Mexico and Arizona. Instead of a lawn, the building will be surrounded by desert vegetation. It replaces the old Barker substation which formerly occupied a site several blocks away and which is said to have been the first electric power house erected between the Mississippi River and the Pacific Coast.

The new substation is built to contain an automatic transformer and feeder lines and will cost approximately $100,000 with equipment.

Nova Scotia Develops Her Power Resources

Eastern Province, Which Has 65,700 Hp. of Installed Water Power, Expects Ultimately 400,000 Hp.—Power Commission the Main Factor

DURING the last four or five years notable progress has been made in harnessing the water powers of the Province of Nova Scotia, and the quantity of hydro-electric energy produced per head of the population now compares quite favorably with that of other provinces.

The developed water powers of the province total 65,700 hp., used largely for general distribution. The largest plants are those of the Nova Scotia Power Commission, which include two stations at St. Margaret Bay, with installations totalling 11,975 hp., and two stations on East River Sheet Harbor, the first at Malay Falls with 5,500 hp., furnishing energy to the coal-mining and industrial centers of Pictou County, and the second at Ruth Falls, with 6,290 hp. The Avon River Power Company has a development of 2,500 hp. at Hemlock Falls on the Avon River which serves Windsor and adjacent district. The pulp and paper industry is responsible for the development of 16,600 hp. in a number of plants, of which the largest are those of the MacLeod Pulp & Paper Company on the Mersey River at Liverpool with 7,000 hp.

Recent improvements in the design of automatic equipment for power stations will make it possible to utilize many sites that in the past were not considered attractive. It is now estimated that there is sufficient power to warrant a turbine installation in the province on a commercial basis of 400,000 hp. Last year new installations to the extent of 8,440 hp. were brought into operation, while a number of developments were undertaken which, when completed, will add 34,500 hp. to the province's total. The outstanding construction was that carried forward by the Nova Scotia Power Commission. The Sandy Lake development of the St. Margaret Bay system was brought completely into operation by the installation of the second generator. The commission has investigations under way with a view to diverting water from the Ingram River into the Indian River. Sites have also been investigated on the Northeast and Sackville Rivers. From all these sources it has been tentatively estimated that 25,000,000 kw.-hr. of new energy may be made available.

At the present time the commission has three developments under construction on the Mersey River, which will have a combined capacity of 31,050 hp. The first is at Upper Lake Falls with 7,750 hp., the second at Lower Lake Falls with 10,600 hp., and the third at Big Falls with 12,700 hp. This power is being developed to fulfill a contract with the Mersey River Paper Company which calls for the delivery of 20,000 hp. on January 1, 1930, to supply a new paper mill. The commission also has a development of 3,000 hp. capacity under construction at Tusket Falls on the Tusket River. The energy from this plant will go to the Western Nova Scotia Electric Company and the Cosmos Imperial Mills, Ltd. It is expected that power delivery will commence about October 1 next.

Among small plants, the Digby County Board has a 340-hp. unit at Sissiboo Falls on the Sissiboo River and has been very active in the construction of distribution lines in the county. Last year the Northumberland Light & Power Company constructed a 190-hp. unit on the Waugh River and 45 miles of 6,600-volt transmission line to serve the district from River John to Malagash.

Commission's Plant at Malay Falls, Nova Scotia

Maryland Men Join in Move for Merchandising

Need for increased merchandising activities on the part of central-station companies was the keynote of the seventh summer meeting of the Maryland Utilities Association on August 30 in Ocean City, Md. In recognition of the jubilee celebration particular attention was given to lighting. Three hundred delegates from all parts of Maryland attended. H. A. Brooks of the Potomac Electric Power Company presided.

W. R. Winans, manager of the public utilities division of the Frigidaire Corporation, said that the use of "Frigidaires" produces an income of $50,000,000 to power companies, yet these companies have marketed only 5 per cent of the number now in operation. J. W. McIver, publicity manager of the Edison Lamp Works, pointed out that the annual advertising appropriation of one large cigarette company exceeds that of the entire lighting industry. G. W. Kable, director of the national rural electric project with headquarters at the University of Maryland, stated that one of the most important of the recent developments in farm electrification is the increasing use of electric equipment in dairies.

I.E.S. Arranges Program

Eight Business Sessions, One Especially for Central-Station Men and One for "Light's Golden Jubilee," Will Mark Philadelphia Meeting

A MEETING of special interest to central-station illuminating engineers will precede the twenty-third annual convention of the Illuminating Engineering Society at the Bellevue-Stratford Hotel, Philadelphia, September 24-27. The convention proper will embrace seven business sessions, sightseeing trips by motor car, a visit to the Longwood Gardens estate of Pierre S. du Pont, the president's reception and dance, a testimonial luncheon to foreign members and visitors, and the annual banquet, entertainment and dance. Below is the business program:

MONDAY, SEPTEMBER 23

Afternoon. — Preconvention Meeting for Central-Station Lighting Service Engineers: "The Residence Lighting Problem," Sarai Waugh; symposium on lighting service problems: H. H. Balkam, J. F. Mayo, A. A. Brainerd, M. R. Rodger, R. B. Brown, Jr., S. W. Thompson and F. C. Eteson; "Selling Foot-Candles Instead of Watts," A. A. Brainerd; "Decorative Color Lighting for Ballroom in St. George Hotel, Brooklyn," F. J. Cadenas.

TUESDAY, SEPTEMBER 24

Morning.—Opening Session: Address of welcome, Harry A. Mackey, Mayor of Philadelphia; president's address, Merritt C. Huse; general secretary's report, A. B. Oday; report of committee on progress, J. W. Barker; "The Art of Committee Work," Preston S. Millar.

Afternoon.—"Light's Golden Jubilee" Session: Opening remarks by President Huse, including demonstration of lighting in 1879 and 1929; "Life of Thomas A. Edison," E. J. Cattell; talking motion pictures; "Pioneer Days in the Lighting Art," Elmer A. Sperry; "Festive Lighting for 'Light's Golden Jubilee'," A. L. Powell; address, Representative Charles A. Eaton.

WEDNESDAY, SEPTEMBER 25

Morning. — Lighting Service Session: "Ratio of Light to Power—Twenty Industrial Plants in Detroit," H. E. Cook and T. G. Ward; "Lighting Service Aid to the Architect," Leroy E. Kern; "Influence of Wiring on Lighting Practice," E. A. Brand; "Co-operative Promotion of Electrical Advertising," C. R. Tracy; "Promotion of Street and Highway Lighting by Central Stations," W. T. Blackwell.

THURSDAY, SEPTEMBER 26

Morning. — Lighting Practice Session: "Theater Lighting, Its Tragedies, Its Virtues," Frank Cambria and Francis M. Falge; "Lighting Conditions and Problems in South Africa," H. A. Tinson; "Colored Floodlighting of the International Exposition at Barcelona," Charles J. Stahl; "Suggestions on the Design and Installation of Lighting Demonstrations," D. W. Atwater; "Lighting of Outdoor Stages at Canadian National Exhibition," F. C. Mayberry and George G. Cousins.

Afternoon. — Natural Lighting Session: "Calculation of Daylighting and Indirect Artificial Lighting by Protractor Method," H. H. Higbie and W. Turner-Szymanowski; "Predetermination of Daylighting by the Fenestra Method," W. C. Randall and A. J. Martin; "The Color of Daylight," A. H. Taylor; "Gas-Filled Lamps as Photometric Standards," Ray P. Teele. Parallel General Session: "Lighting à la Mode," J. L. Stair; "Reflecting Properties of Flowers and Colored Foliage," Samuel G. Hibben; "The New Science of Seeing," M. Luckiesh and F. K. Moss; progress report, subcommittee on testing specifications, Walter Sturrock.

FRIDAY, SEPTEMBER 27

Morning. — Symposium on Ultraviolet Radiation: "Measurement of Ultraviolet Radiation in Natural Light," L. R. Koller; "Hygienic Effects of Ultraviolet Radiation in Daylight," H. P. Gage; "Recent Developments of Window Materials and Fabrics for Transmitting Ultraviolet Radiation," W. W. Coblentz; "Sunlight, Natural and Synthetic," C. E. Greider and A. C. Downs.

Briefer News

NEW SUBSTATION FOR SACRAMENTO, CALIF.—The Pacific Gas & Electric Company is constructing a new transformer substation, to be known as Station C, at Fourth Avenue and Fifty-second Street, Sacramento, Calif. The building will be of concrete and will house switches, regulators and automatic operating equipment.

RED WING, MINN., WANTS TO BUILD HYDRO PLANT.—A public hearing on the application of the city of Red Wing, Minn., for a power project at the Hastings dam is to be held in the St. Paul federal building on September 10, it is announced by Lieutenant-Colonel Willing, United States district engineer. At this hearing navigation interests are to be represented as well as cities and towns along the river.

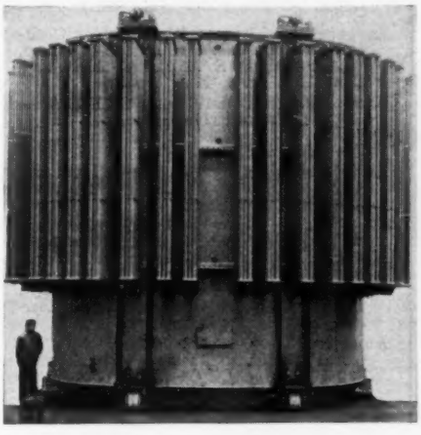
NEW INTERSTATE LINE WILL SERVE ALABAMA COMMUNITIES FROM MISSISSIPPI.—The Alabama Public Service Commission has approved a petition from the Interstate Utilities Company of State Line, Miss., to cross the Alabama state line and furnish power to the towns of Escatawpa, Chatom, Yellow Pine and Fruitdale. The company will be required by the commission to keep a record of the amount of all power sent across the state line.

PUGET SOUND POWER & LIGHT ASKS NEW TACOMA FRANCHISE.—Application of the Puget Sound Power & Light Company for a franchise to sell power in Tacoma, Wash., for the next 25 years has been received by the City Council and referred to Commissioner Ira S. Davisson for a report. The latter has expressed an opinion that the traction franchises in Tacoma, owned by interests allied to those in the power company, should be settled at the same time with the power franchise.

NEW NEBRASKA TRANSMISSION LINES.—The Nebraska State Railway Commission has granted the Nebraska Power Company, Omaha, authority to construct a transmission line in Douglas County; the Southern Nebraska Power Company, Superior, authority for the construction of lines from Red Cloud to Inavale and Riverton and to the Iowa-Nebraska Light & Power Company's lines in Seward County, and the Western Public Service Company, Scottsbluff, authority to build a line between Lewellen and Oshkosh. The Iowa-Nebraska Light & Power Company has petitioned for authority to construct a line in Hamilton County.

INITIAL INSTALLATION OF 500,000 HP. THE AIM AT BEAUHARNOIS PLANT.—Active construction work has begun on the Beauharnois power canal, about two miles from Valleyfield, Quebec. The work now contemplated will permit the company to produce at least 200,000 hp. by the autumn of 1932. From then on it will utilize power from its own plant to continue widening its power and navigation canal. The company has the right to divert 40,000 sec.-ft., which will produce 350,000 continuous horsepower. It may permit a commercial installation of 500,000 hp. In any event, announcements say, the power house will be designed to permit an initial installation of ten 50,000-hp. generating units.

TRANSFORMERS STAND TEST OF 570,000 VOLTS.—Here is one of the four giant transformers built by the Westinghouse Electric & Manufacturing Company at its plant in Sharon, Pa., for installation at Roseland, N. J., near Newark, where they will be used to transfer power from the Pennsylvania Power & Light Company's plant at Bushkill, Pa., to the Public Service Electric & Gas Company's system in New Jersey. Each transformer is 35 ft. high, weighs approximately 300 tons and requires a floor space 22 ft. by 23 ft. There are more than 32 miles of wire in the copper windings in each



transformer, and more than three tank cars of oil, or 32,000 gal., will be required to fill each of them. The transformers are rated at 220,000 volts, but were tested at 570,000 volts, which, the manufacturer says, is the highest test voltage ever applied to a power transformer.

WINTER GARDEN, FLA., TO BE SUPPLIED FROM TRUNK LINE.—The Florida Public Service Company, which recently purchased the municipal electric plant at Winter Garden, Fla., is erecting a transformer substation in that city. When it is completed customers there will be supplied with energy generated at the company's Benson Springs and Avon Park generating stations and the local plant maintained as a standby station only.

DUKE POWER COMPANY'S BASE-LOAD STEAM PLANT ALMOST READY.—The 112,000-kw. steam-electric plant of the Duke Power Company now under construction at Riverbend, near Mount Holly, N. C., will be placed in operation about September 20, it is announced at the offices of the company in Charlotte. The station will be in constant operation as a base-load plant after its completion and will take care of anticipated increases in the consumption of power in 1930. No announcement has been made as to the time of the probable further development of the plant, which is designed for an ultimate rating of 450,000 kw. Officials of the company report that for the first six months of this year 58 new industrial plants were established on the transmission lines of the Duke system.

GRAFTON, N. D., VOTES FOR NEW MUNICIPAL ELECTRIC PLANT.—Expenditure of $77,000 for a new municipal electric plant has been approved by citizens of Grafton, N. D., at a special election which brought to a climax a campaign over the issue whether the municipality should improve existing facilities or grant a franchise to a private power corporation.

NEW 110-KV. TRANSMISSION LINE WILL CONNECT MISSISSIPPI SYSTEMS.—Commencement of construction of a 110-kv. transmission line between Jackson and Durant, Miss., is announced by Vice-President L. V. Sutton of the Mississippi Power & Light Company. Durant is 61 miles north of Jackson, and this line will be the first direct connection between the company's southern system, served largely from the Sterlington (La.) generating plant, and its northern system, served from Sterlington, by way of Arkansas via Greenville, and also from the Remmel hydro-electric plant in the latter state and from Memphis, Tenn. The new line is scheduled for completion in November.

TERMS OF CONTRACT FOR DAYTON-SPRINGFIELD (OHIO) CONTRACT.—The contract announced recently by officials of the Dayton (Ohio) Power & Light Company for the erection of transmission lines between the Dayton plant and the Ohio Edison Company's plant at Springfield has been presented to the Public Utilities Commission of Ohio. The terms call for the erection of transmission lines to the Clark-Montgomery county line by each company. Each will build a substation. The length of the contract is three years, for which term the Ohio Edison Company agrees to pay the Dayton Power & Light Company $165,000 and use 96,000,000 kw.-hr. from the Dayton plant.

AS THE PUBLIC OWNERSHIP LEAGUE SEES IT.—The twelfth annual report of Carl D. Thompson, secretary Public Ownership League of America, has this to say, under the heading "Municipal Ownership Campaigns": "Steadily throughout the year the Public Ownership League has responded to calls from various parts of the country to assist in very important municipal ownership campaigns. One of these trips took the secretary to southern Idaho for a series of lectures and addresses. Several trips were made to Nebraska, others to different points in Missouri, Arkansas, Ohio, New York, Kansas, Wisconsin, Minnesota, Indiana, Iowa, Illinois and Ken-

tucky. In this way the league has campaigned in thirteen states during the year—in some of them repeatedly. We estimate that fully 80 per cent of these campaigns are successful, either in defeating the sale of a municipal plant or in promoting new projects."

CALIFORNIA COMMISSION WILL NOW INVESTIGATE RATES OF LOS ANGELES GAS & ELECTRIC. — Following closely upon investigations begun into the rates of the Pacific Gas & Electric and Great Western Power companies, the California Railroad Commission has instituted an inquiry into the rates of the Los Angeles Gas & Electric Corporation, along with various gas and telephone companies.

WESTCHESTER LIGHTING COMPANY REDUCES RATES. — The Westchester Lighting Company of Mount Vernon, N. Y., and its affiliated companies, the Northern Westchester Lighting Company of Ossining and the Peekskill Lighting & Railroad Company, have announced a reduction in electric light rates by which the bills of residential and commercial customers will be reduced from 3½ to 17 per cent, depending upon the territory supplied and the amount of energy used. It is estimated that the rate cut will mean an aggregate annual saving of $500,000 annually to consumers in Westchester County. The companies form an outlying section of the power system of Greater New York controlled by the Consolidated Gas Company.

ELECTRIC WELDING IN DETROIT-WINDSOR TUNNEL.—The new vehicular tunnel which will run under the Detroit River between Detroit and Windsor, Canada, is being constructed on dry land in sections that are launched, floated into position and sunk to their places on the bottom of the river. Each 250-ft. section of the tunnel, with an inside diameter of 31 ft. and an outside diameter of 35 ft., is constructed on regular launching ways, much as is a steel ship. The sections are built up of 24-ft. strips of steel plate electrically welded together with General Electric welding machines. Approximately 1¾ tons of welding electrode are required for the 5,200 ft. of calk welding around the full circumference of the shell in 42 places and for the 1,100 ft. of butt welding.

INTERCONNECTION IS PLANNED FOR NORTH IRELAND.—A scheme for supplying electrical energy to the industries and townships of Antrim and Londonderry, in the north of Ireland, is being launched by the Antrim Electricity Supply Company, which has the right to furnish electricity in the greater part of the County of Antrim and a portion of the County of Londonderry, where many factories and mills desire electric power. The company, which has already received inquiries for more than 20,000,000 kw.-hr. a year, is building transmission lines and will probably extend its power station at Curran Point in the near future. Eventually it plans interconnection with the system of the Belfast Electricity Supply for the establishment of a "ring main" around Ulster.

HOUSTON LIGHTING & POWER READY TO REDUCE RATES.—A general reduction of rates proposed by the Houston Lighting & Power Company has been indorsed by George H. Pruter, city manager and public service commissioner of the Texas city. The proposed schedule is 7 cents per kilowatt-hour per room for the first 3 kw.-hr. and 4 cents for consumption in excess of this up to 200 kw.-hr. A 2½-cent rate is charged for use of from 200 to 2,000 kw.-hr., and all over that carries a charge of 1½ cents. At present the primary rate is 8 cents per kilowatt-hour. The secondary rate is 5 cents.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue of July 6, page 46.]

International Association of Electrical Inspectors—Northwest Section, Vancouver, B. C., Canada, Sept. 9-11. F. D. Weber, P.O. box 745, Portland, Ore.

Association of Edison Illuminating Companies—Chateau Frontenac, Quebec, Sept. 9-12. P. S. Millar, 80th St. and East End Ave., New York.

New England Division, N.E.L.A. — Hotel Griswold, New London, Conn., Sept. 9-12. Miss O. A. Bursiel, 20 Providence St., Boston.

American Welding Society—Cleveland, Sept. 9-13. M. M. Kelly, 29 West 39th St., New York.

Empire State Gas and Electric Association—Electric Meter Section, New York Edison Auditorium, New York, Sept 12-13; annual meeting, Saranac Inn, Saranac Lake, N. Y., Sept. 19-20. C. H. B. Chapin, Grand Central Terminal, New York.

American Electrochemical Society — Hotel William Penn, Pittsburgh, Sept. 19-21. C. G. Fink, Columbia University, New York.

Illuminating Engineering Society — Bellevue-Stratford, Philadelphia, Sept. 24-27. A. B. Oday, 29 West 39th St., New York.

Great Lakes Division, N.E.L.A. — French Lick Springs, Ind., Sept. 26-28; Engineering Section, Lorain Hotel, Madison, Wis., Oct. 23-26. T. C. Polk, room 110, 140 South Dearborn, St., Chicago.

American Electric Railway Association —Atlantic City, Sept. 30-Oct. 4. J. W. Welsh, 292 Madison Ave., New York.

Association of Electragists International—New Ocean House, Swampscott, Mass., Sept. 30-Oct. 3. L. W. Davis, 420 Lexington Ave., New York.

National Safety Council — Stevens Hotel, Chicago, Sept. 30-Oct. 4. W. H. Cameron, 108 East Ohio St., Chicago.

National Electrical Manufacturers' Association—Wardman Park Hotel, Washington, Oct. 7-11. S. N. Clarkson, 420 Lexington Ave., New York.

American Society of Mechanical Engineers—National fuel meeting, Bellevue-Stratford Hotel, Philadelphia, Oct. 7-10. C. W. Rice, 29 West 39th St., New York.

Kansas Section, N.E.L.A. — Wichita, Oct. 17-18. H. Lee Jones, Kansas Gas & Electric Co., Wichita, Kan.

Public Utilities Association of West Virginia—Charleston, W. Va., Oct. 23-24. A. Bliss McCrum, P. O. Box 1483, Charleston, W. Va.

American Engineering Council—Mayflower Hotel, Washington, Oct. 24-25. L. W. Wallace, 26 Jackson Place, Washington, D. C.

ANOTHER HYDRO PLANT FOR THE ROANOKE?—Negotiations toward building a large hydro-electric plant on the Roanoke River near Boydton, Va., are reported at Richmond to be under way, though the identity of those interested has not been revealed. The dam, according to the report, will raise the Roanoke River at that point to a height of 266 ft. above sea level.

NEW YORK STATE MUNICIPALITIES MAY TAKE HAND IN REVISING COMMISSION LAW.—Corporation counsels and village attorneys of all cities and first-class villages of New York State will meet at Albany September 10 to consider the advisability of the municipalities creating a committee to prepare and submit recommendations to the temporary commission now considering a revision of the Public Service Commission law. The meeting has been called by the New York State Conference of Mayors.

GERMAN ENGINEERS TO DISCUSS WORLD POWER CONFERENCE PLANS WITH AMERICAN CONFRERES.—Plans for the second plenary session of the World Power Conference, to be held in Berlin next year, will be discussed by a group of German engineers now en route to the World Congress of Engineers in Tokyo with the American committee of the conference first named when the two groups meet at a dinner to be given by the Americans to the Germans at the University Club, New York, on the evening of September 11. Fifteen transatlantic engineers are expected to be present, including Dr. Carl Koettgen of the Siemens-Schuckert company, chairman of the German committee of the World Power Conference and president of the German Federation of Engineers; Dr. Conrad Matschoss, secretary of the German committee; Dr. Adolph Krauss, Dr. Otto Petersen, Dr. Fry of the Krupp Works and Professor Probst.

PRELIMINARY WORK ON LEWIS RIVER PROJECT. — Granting by the Federal Power Commission of a preliminary permit to the Inland Power & Light Company, Portland, Ore., to develop 170,000 hp. on the Lewis River in southwestern Washington opens the way for preliminary work toward the development of this project at the Ariel site, 12 miles above Woodland. Work on a transmission line from Vancouver is to be started at once so that power for construction will be available when needed. Foundation tests for the dam have been completed. Development of the project is planned in four units of the same size. A single dam, about 190 ft. high above normal water level, will create a lake about 12 miles long, impounding approximately 220,000 acre-feet of usable storage. A single power house, designed to be expanded as units are added, will be built immediately below the dam. The dam and first unit are estimated to cost $8,250,000, and the total ultimate cost of the four units without transmission lines is put at $11,500,000.

LIGHTNING TESTS TO BE MADE ON OLD CONSUMERS POWER LINE.—A pioneer 110-kv. transmission line built in 1906 by the Consumers Power Company between Croton and Grand Rapids, Mich., has been selected by engineers of the General Electric Company for studies of the strains and surges affecting the transmission of power which are caused by lightning. The company's portable equipment, manufactured for the purpose of generating artificial thunderbolts in the field, will be employed in these researches. The line has been taken out of service for the studies, which thus far have been made on the de-energized line. Arrangements are being made to energize it through a special transformer bank for future tests.

DETROIT TO INSTALL THREE AUTOMATIC RAILWAY SUBSTATIONS.—Modern practice in the design of automatic railway substation equipment is well illustrated in three substations to be installed by the Public Lighting Commission of the city of Detroit for supplying power to the Detroit Street Railways. Each station will contain a single 2,000-kw., 600-volt, 60-cycle shunt-wound synchronous converter with 24,000-volt, three-phase transformer and automatic switching, all of which is being supplied and erected by the Westinghouse Electric & Manufacturing Company. The transformer room is within the building, but is separated from the machine and switchboard portion. Separately mounted 600-volt circuit interrupters are to be used for all direct-current switching, erected on simple concrete pedestals. Particular attention has been given to the building design by the consulting engineers and architects, Smith, Hinchman & Grylls. A pleasing architectural effect, suitable for residential districts, is combined with the practical features necessary in a modern automatic substation.

DIVISION OF POWER PROFITS FROM MINIDOKA RECLAMATION PROJECT IN DISPUTE.—Secretary of the Interior Wilbur has appointed a commission of three subordinates in his department, two being Geological Survey engineers, to adjudicate a dispute regarding the equitable division of profits from the sale of power from the Minidoka reclamation project on the Snake River in Idaho. At present 94.6 per cent of the proceeds are allocable to the Burley, or pumping, division of the project and only 5.4 per cent to the Minidoka, or gravity, division. The Minidoka water users claim that the division should be on the basis of all development expenses, including the dam and transmission lines and not merely the power house, most of the cost of which was borne by the Burley end. The Minidoka users claim about 40 per cent of the net revenue, which has run around $100,000 a year. The final decision is expected to have an important bearing on the major federal projects throughout the West, especially those on the Colorado and Columbia Rivers.

Niagara, Lockport & Ontario Takes Jamestown to Court

The Niagara, Lockport & Ontario Power Company is carrying to the New York Supreme Court its efforts to compel the city lighting plant of Jamestown, N. Y., to charge against its costs and rates the services and facilities furnished to the lighting plant by the taxpayers without charge.

The petition recites the proceedings taken before the Public Service Commission (ELECTRICAL WORLD, June 22, page 1305) and charges that the lighting plant of Jamestown, while showing a large annual paper profit, is actually serving at less than cost because it is not reimbursing the city for rental of property used, for services rendered it by various city officials whose salaries are paid by the taxpayers, for the expenses of government which should be included in the tax rate and for the use of the property devoted to public service. It asserts that the commission has jurisdiction and should have heard the evidence and rendered a decision on the merits.

Recent Court Decisions

OIL ENGINES NOT IN CATEGORY OF "PUBLIC IMPROVEMENTS" AS REGARDS THEIR PURCHASE BY CITY.—Johnston vs. City of Stuart was an action in equity to enjoin the city from carrying out a contract for the purchase of oil engines and auxiliary equipment on the ground that the contract violated a law requiring cities to give hearings before contracting for public improvements. The Supreme Court of Iowa held that the engines did not come in the category of "buildings" or "other construction work" and were not "public improvements" in the sense of the statute. Nor did the contract impose a general obligation exceeding the legal debt limitation, since the parties, while not specifically providing that payment should be made in installments from the net annual income of the plant, clearly contemplated this method of payment and the city filed a definite statement from the seller to that effect. (226 N. W. 164.)*

COMPANY NOT LIABLE FOR DAMAGE CAUSED BY FIRE DUE TO POLE SETTERS SMOKING WHILE AT WORK.—Reversing the finding of the lower court, the District Court of Appeals in the Third District of California found, in Yore vs. Pacific Gas & Electric Company, that the presumption that workmen are accustomed to smoke while at work did not justify the claim that the company was negligent in not prohibiting the careless use of cigarettes or matches by employees engaged in reconstructing an electric pole line on a right-of-way covered with dry grass and weeds, it not having been shown that the company or its agents knew that employees were addicted to smoking under such conditions. The smoking and the careless acts of the men did not come within the scope of their employment, and their employer was not negligent because it did not remove the dry grass from a right-of-way more than three miles long, even though a fire started from the workmen's carelessness destroyed pasturage, cordwood and fence posts. (277 Pac. 878.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

EXPORTERS OF POWER BEYOND STATE BOUNDARIES SHALL NOT ACT TO DETRIMENT OF CUSTOMERS WITHIN STATE.—Maintenance of proper service at reasonable rates within New Hampshire was made by the Public Service Commission of that state a prerequisite to the sanction of exportation of energy beyond the commonwealth's boundaries by the Grafton Power Company. The commission ordered that: (1) "Said Grafton Power Company shall furnish service to consumers of electrical energy within the state at fair, just and reasonable rates and upon terms as favorable as shall be granted to consumers outside the state, having due regard to all facts and conditions which may affect the subject; (2) said company shall discontinue such business, in whole or in part, to such extent and under such conditions as the commission may order, whenever, after notice to said company and hearing thereon, the commission shall find that such energy, or any portion thereof affected by this order, is reasonably required for use within this state and that the public good requires that it be delivered for such use; (3) said company shall make, renew or extend any contract for the delivery of electrical energy to another utility upon such terms and conditions as the commission shall order to be for the public good; (4) said company shall make no contract for service at rates other than those fixed by its schedule of general application, except as the commission shall by order allow."

PETITION TO RESTORE SPECIFIC RATES REFUSED.—Certain customers of the Edison Electric Illuminating Company of Boston having petitioned the Massachusetts Department of Public Utilities to order certain specific rates of that company, applicable to heating and cooking devices, restored, the commission said: "This department has not heretofore undertaken to regulate rates below the maximum rates except where such rates appeared to effect discriminations, and we do not deem it advisable to make orders in relation to specific power rates without giving consideration to the entire structure of the power rates. . . . Differentials in rates, based solely upon the use to which the electricity is to be applied, without regard to other factors, are not, as a general rule, to be favored as they are apt to result in unreasonable discriminations. Moreover, the rate involves separate circuits and more than one meter. The only argument that appeals to us in favor of the restoration of this rate is that persons were induced to purchase and install electric appliances, relying upon the rate. In view, however, of the present rate being more favorable to the great majority of the domestic customers, we do not think that we should require the company to restore the rate when it involves unnecessary utilization of meters and circuits and where generally it becomes a preferential rate when under its operation the cost of the electricity to the customer is less."

News About Men of the Industry

W. G. Jens Named Operating Manager

Walter G. Jens, manager of the Pittsburgh branch of the Byllesby Engineering & Management Corporation, has been appointed operating manager of the Duquesne Light Company. Mr. Jens has been a member of the Byllesby organization for nineteen years, during which time he has been engaged in construction work in various parts of the United States.

He entered the service of the Byllesby Engineering Management Corporation in May, 1910, and in May, 1926, became general superintendent of construction at the Pittsburgh branch of the corporation. Mr. Jens was appointed manager of the branch in December, 1927, remaining as such until his recent appointment to the Duquesne Light position.

JOSEPH C. RAH, formerly of the G. & W. Electric Specialty Company, engineering department, is now connected with the Delta-Star Electric Company in a consulting capacity.

A. E. HALLIWELL, formerly engineer in the marine department of Foster, Wheeler, Ltd., has taken up the duties of director and engineer with Phillips & Sons (Chiswick), Ltd., electrical and mechanical engineers, of 42 Waterford Road, Walham Green, S.W.6, London.

WALTER H. DUNLAP has been appointed engineer of the Public Utilities Commission of the District of Columbia to succeed R. G. Klotz, resigned. Mr. Dunlap was formerly connected with the United States Coast and Geodetic Survey and more recently with the Interstate Commerce Commission.

THOMAS A. EDISON is recovering in his home in West Orange, N. J., from an attack of pneumonia which began with a cold contracted on August 11. Dr. Hubert S. Howe of New York, one of the physicians attending the inventor, reports that Mr. Edison is now in the convalescent stage and is regaining his strength rapidly.

CLARENCE L. COLLENS, vice-president in charge of the Policies Division of the National Electrical Manufacturers' Association, has been appointed to the board of directors of the American Standards Association. Mr. Collens was designated for that position by the National Electrical Manufacturers' Association, which is a member body of the A.S.A. He is president of the Reliance Electric & Engineering Company of Cleveland.

JOHN E. NICHOLAS has been appointed to conduct rural electrification research work in the school of agriculture and experiment station of Pennsylvania State College. Mr. Nicholas, who was graduated from Lehigh University in the mechanical engineering course, was employed several years by the Bethlehem Steel Company. Later he took his master's degree at Massachusetts Institute of Technology, and for the past three years has been employed in the department of mechanical engineering at the University of Minnesota.

N. E. Funk Vice-President of Philadelphia Electric

Nevin E. Funk, for the past year assistant general manager of the Philadelphia Electric Company, has been elected vice-president in charge of engineering of that company according to an announcement made by W. H. Taylor, president. The selection of Mr. Funk to direct the engineering work of that utility follows a period of service which covers twenty-two years. His technical training received at Lehigh University,

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combined with the practical experience obtained in the numerous positions he has held, has given him a broad knowledge of engineering practice and his experience as assistant general manager has equipped him with a supplementary knowledge of general public utility problems in addition to those of engineering.

Mr. Funk's early connections included the New York Central Railroad and the Westinghouse Electric & Manufacturing Company. He taught in the electrical school of the Georgia School of Technology, Atlanta, before affiliating himself with the Philadelphia Electric Company. Starting in a subordinate position, he gradually worked his way up through the ranks, and in 1917 he was named assistant operating engineer. Subsequently he served as operating engineer, assistant chief engineer, chief engineer and finally assistant general manager. Mr. Funk has been active in the National Electric Light Association and holds membership in the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and other technical associations.

C. D. THOMAS, formerly of Roanoke, Va., has been appointed manager of the Lynchburg Traction & Light Company, Lynchburg, Va., to succeed D. C. Frost, deceased. Mr. Thomas has been in Lynchburg three months. He is a native of Abingdon, Va., and an alumnus of Virginia Polytechnic Institute.

J. M. R. FAIRBURN of Montreal and F. A. GABY of Toronto have been selected as Canadian delegates to the Tokio sectional session of the World Power Conference, to be held in October. Mr. Fairburn is chief engineer of the Canadian Pacific Railway and Mr. Gaby is chief engineer of the Ontario Hydro-Electric Power Commission.

L. R. LUDWIG, who has been connected with the railway motor engineering department of the Westinghouse Electric & Manufacturing Company, has been made the recipient of the first award of the Lamme memorial scholarship, founded by the Westinghouse Electric organization as a tribute to its late chief engineer, Benjamin G. Lamme. This scholarship is to be awarded annually to an engineer in the employ of the company who has shown outstanding ability in his work. Provision is made for the recipient to carry on a year's post-graduate study in a school which he may select either in this country or in Europe. Mr. Ludwig joined the Westinghouse company in 1925 in East Pittsburgh. He is a member of the American Institute of Electrical Engineers.

L. E. GRIFFITH has been elected to the board of directors and a vice-presidency of the Riley Stoker Corporation, Worcester, Mass. Mr. Griffith was graduated from Lafayette College at Easton, Pa., in the class of 1912. Since that time he has had extensive sales-engineering experience through his successive connections with the Thompson-Starrett Company at New York and Chicago, the Babcock & Wilcox Company, the United Machine & Manufacturing Company and the Riley Stoker Corporation. At the time the Riley Stoker Corporation purchased the United Machine & Manufacturing Company, which manufactured the Harrington stoker, Mr. Griffith was president of the latter company. Since that time he has been district manager of the New York office of the Riley Stoker Corporation and in 1928 was appointed sales manager of that corporation.

E. P. MARKEE, district manager Edison Lamp Works of the General Electric Company, Los Angeles, and MORRIS HIXSON, who holds a similar position in San Francisco, have been named by Charles T. Hutchinson, chairman of the advisory committee of the California Electrical Bureau, as chairmen of committees for southern and

northern California, respectively, to assume charge of all organizational work for the participation of the electrical industry in the State of California in the celebration of Light's Golden Jubilee on October 21. The object of these committees will be to create in each community a local sponsoring committee and to enlist in the movement the co-operation of all civic bodies, service clubs and similar organizations to the end that a fitting tribute may be paid to the inventor of the incandescent lamp on the anniversary of its invention.

JOSEPH H. BRIGGS, vice-president of the Standard Gas & Electric Company, has been elected a director of Electric Household Utilities Corporation to fill the vacancy caused by the death of Edward F. Carry, president of the Pullman Company.

GUY L. NORRIS has been appointed manager of the Barre district of the Green Mountain Power Company, with headquarters at Barre, Vt. For the past five years he has been superintendent of the company's meter department. He has been in the employ of the organization for seventeen years.

K. M. ROBINSON, formerly division manager Idaho Power Company, Payette, Idaho, has been promoted to the general office at Boise to handle special assignments under the general manager. Succeeding Mr. Robinson at Payette is J. C. BALDRIDGE, formerly superintendent of rural service, who is in turn succeeded by ROBERT OVERSTREET, who also will continue as the company's agricultural engineer.

J. W. EVERETT has resigned his position with the Duncan Electric Manufacturing Company at Lafayette, Ind., to enter the operating field by taking charge of the standardizing and testing laboratories of the Pennsylvania Power & Light Company, with headquarters at Hazelton, Pa. Mr. Everett has been in charge of similar work with the Duncan organization since his graduation from Purdue University in 1924.

WILLARD ALLPHIN, for the past four years lighting engineer of the Fall River (Mass.) Electric Light Company, has been appointed lighting specialist for the Graybar Electric Company in the New England territory. Mr. Allphin is a well-known contributor to the ELECTRICAL WORLD on illuminating engineering applications and has been active in the Lighting Engineers' Club of New England since its formation. He is a graduate of the Massachusetts Institute of Technology in electrical engineering, class of 1925.

E. D. SPICER, superintendent of the refrigeration department of the General Electric Company, has been made assistant manager of the Schenectady works. A graduate of Cornell University, class of 1912, he joined the General Electric Company in 1924 and was assigned to the staff of H. F. T. Erben in the general manufacturing department. Subsequently he joined the staff of James A. Smith, superintendent of the Schenectady works, and later he was placed in charge of the insulator and carbon brush department. Then he became superintendent of the radio department, and from that position was promoted to the superintendency of the refrigeration department.

R. L. COOPER, for five years sales manager for the Missouri Public Service Company at Trenton, has been transferred to Concordia, Kan., as the sales manager for the Kansas Power Company at that place.

L. W. DICK, formerly connected with the Lewiston office of the Pacific Power & Light Company, has been appointed district manager at Pomeroy, Wash., for that utility. This promotion comes after sixteen years of service with the Pacific Power & Light and the predecessor company in Lewiston.

RALPH E. SECORD, power engineer of the Quincy (Mass.) Electric Light & Power Company, has been appointed sales manager of that utility, succeeding Herbert Southworth, who has been appointed sales manager of the Fall River (Mass.) Electric Light Company. Mr. Secord was formerly in the engineering department of Stone & Webster, Inc., and entered the employ of the Quincy Electric Light & Power Company in the fall of 1928.

CHARLES W. NICKERSON has been appointed to the public utility division of the F. A. Bartlett Tree Expert Company of Stamford, Conn. Mr. Nickerson enters upon his new duties after an association with electric utilities of eighteen years, serving with the Westchester Lighting Company for nine years, as superintendent of the Yonkers Electric Light & Power Company for five years and as superintendent of transmission and distribution and assistant engineer, transmission and distribution department of the New York Edison Company, for the past four years.

C. J. RATTERMANN has been appointed assistant manager of the electrical department of the Allis-Chalmers Manufacturing Company and will be located at the Norwood (Ohio) plant. He started in February, 1901, with the Bullock Electric Manufacturing Company, Norwood, which firm was subsequently taken over by the Allis-Chalmers company, serving in the test department for several years and then in the sales correspondent department. He was later transferred to the Cincinnati office as salesman, where he served until he was advanced to the position of manager of the Cincinnati office in 1921, which position he held until his new appointment.

DR. F. W. VINCENT has retired as district manager of the Pacific Power & Light Company, Pendleton, Ore. For more than forty years he has been actively engaged in the central-station industry in Pendleton, serving as president of the Pendleton Electric Light & Power Company from 1888 until 1904, when the property passed to the ownership of the Northwestern Gas & Electric Corporation. He remained as manager of that company until the ownership was again changed to the Pacific Power & Light Company in 1910. From that date until his retirement he has served as district manager.

Obituary

ALBERT E. WALDEN, consulting engineer of Baltimore, Md., died last week at his home in that city. Formerly chief engineer of the Baltimore County metropolitan district, Mr. Walden had been a resident of Baltimore since 1906. He was general superintendent, engineer and purchasing agent of the Baltimore County Water & Electric Company until that organization was taken over by the city. He was a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and of other technical associations.

RICHARD S. EMMET, superintendent of the scrap department of the General Electric Company, Schenectady, N. Y., died at Ellis Hospital in that city August 30 following an operation. Mr. Emmet, who had been a resident of Schenectady for more than 26 years, lived with his brother, W. L. R. Emmet, consulting engineer of the General Electric Company and inventor of the electric ship propulsion turbine. He first entered the employ of the General Electric organization in the traction department in 1903 and in 1910 he was transferred to the railroad department. Mr. Emmet has been head of the scrap department since the spring of 1913. He was 66 years of age.

ROBERT H. ANDERSON, for a number of years connected with the Tennessee Electric Power Company and predecessor companies as hydraulic engineer, died suddenly at Blue Ridge, Ga., August 8, at the age of 52. Mr. Anderson was born in Woburn, Mass., in 1878 and was educated at Robert College, Constantinople, Turkey, Williams College and Cornell, receiving a degree in engineering from the latter institution in 1898. Early in his career he engaged in hydraulic engineering work for New York City, the United States Geological Survey and certain private enterprises. In 1900 he first became connected with the Tennessee Electric Power Company, being resident engineer for the J. G. White Construction Company on the construction of two hydro-electric developments for the Tennessee Power Company at Parksville and Caney Creek on the Ocoee River. After undertaking some construction work for the J. G. White Construction Company in 1922 he returned to the Tennessee Electric Power Company as hydraulic engineer, which position he held up to the time of his death.

Financial and Statistical News

ANNOUNCEMENT EARLY THIS WEEK of two more huge utility investment concerns, one a holding company and one a trust, add vastly to the demand side of the market equation and swing public buyers into line by the thousands.

SUCH FACTORS TEND FURTHER TO OBSCURE the present lack of correlation between earning and prices, the brokers' loans situation and money rates. And they would appear to postpone any substantial break, at least in utility stocks.

SEVERAL LARGE BUYERS IN THIS MARKET are paying more attention to the Canadian power and light stocks, many of which are still selling under ten times earnings. Two of these, Power Corporation of Canada and Shawinigan Water & Power, both listed on the New York Curb, have been bought heavily. Others in which United States buyers are showing an interest include Montreal Power, Winnipeg Electric and British Columbia Electric.

Another Huge Holding Company Announced This Week

A mammoth public utility holding and investment corporation, organized under the sponsorship of Harris, Forbes & Company and having a capitalization of 30,000,000 shares, is announced this week. Associated in the banking syndicate are United Founders and American Founders Corporations. The new concern will acquire interests in utilities in this country and in Canada.

While not officially announced, it is rumored that the new concern will have substantial holdings in Associated Gas & Electric and General Gas & Electric, for which groups Harris, Forbes & Company have been bankers.

Only 500,000 shares of class A stock and 2,500,000 shares of common stock are to be outstanding. The authorized capitalization is made up of 5,000,000 shares of class A and 20,000,000 shares of common stock, while the company's Delaware charter authorizes the issuance of 5,000,000 shares of preferred stock at the discretion of the board of directors.

The announcement is significant of the present trend in the utility field toward control through large holding and investment companies.

LUZERNE COUNTY GAS & ELECTRIC CORPORATION.—The directors of the Luzerne County Gas & Electric Corporation have authorized the sale of 5,000 shares of $6 dividend first preferred stock without par value to customers, employees and others at $100 and accrued dividend per share. This issue shares ratably with the first preferred stock now outstanding.

ALLGEMEINE ELEKTRIZITÄTS GESELLSCHAFT APPROVES STOCK INCREASE.—An extraordinary general meeting of the Allgemeine Elektrizitäts Gesellschaft held August 27 approved the allotment of new shares of the nominal value of 30,000,000 marks ($7,200,000). The meeting also approved an increase of capital of 23,750,000 marks ($5,700,000), bringing the total capital to 210,000,000 marks ($50,500,000). American directors elected to the board are Messrs. Owen D. Young, Gerard Swope, Clark Minor, Arthur Baldwin and W. J. Edmonds.

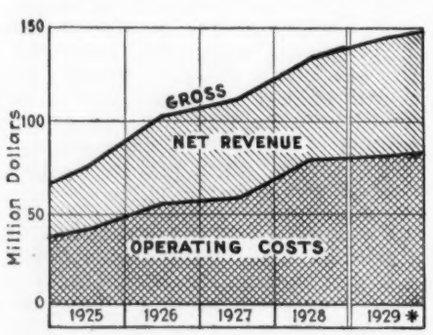
AMERICAN COMMONWEALTHS PLANNING STOCK OFFERING. — Directors of the American Commonwealths Power Corporation are considering a plan to offer stockholders the right to subscribe to additional shares. According to present plans the offer will be of one new share for each ten shares held. The proceeds will be used to simplify the capital structure.

PUGET SOUND UTILITY REPORTS RECORD EARNINGS.—June of this year brought to a close a twelve-month period of the greatest gross earnings from light and power service in the history of the Puget Sound Power & Light Company, Seattle, the company reports show. Steady increase also was recorded in the number of customers served. Gross earnings for June, 1929, were $1,282,268, an increase of $99,082 over gross earnings for June, 1928. The June earnings brought the total of gross earnings for the year ended June 30, 1929, to $15,717,242, an increase of $743,797 over gross earnings during the twelve months ending June 30, 1928.

Commonwealth & Southern Corporation Issues First Statement

THE financial community was much interested last week in the publication by the Commonwealth & Southern Corporation of its first earnings statement. Earnings of 71 cents a share on the outstanding stock of approximately 30,000,000 shares reflect a trend above the average for the industry. This figure is scarcely accurate since it does not reflect the full annual earning power from $60,000,000 received late in the period covered by the report. These earnings, however, represent what the corporation is making after provision for retirement reserve, over $8,000,000.

Commonwealth & Southern Corporation, which was formed last May, and which acquired over 95 per cent of the common stock of the Commonwealth Power Corporation, Southeastern Power & Light Company, Penn-Ohio Edison Company and Columbus Electric & Power Company, showed net earnings of $73,554,311 for the 12 months ended July 31. Gross earnings for the same period were $144,337,403, which places the corporation among the large groups in the public utility field. This represents an increase of 9.24 per cent for the year, while net earnings increased 12.7 per cent for the same period. This larger increase in net earnings than in gross probably reflects some of the benefits of joint operation. In any event, operating expenses increased less than 6 per cent in relation to the increase of almost 10 per cent in gross revenue.



Five-Year Earnings Record of Constituent Companies

*Year Ended July 31.

Net earnings for July showed still larger increase than for the twelve month period. They were $5,801,429, which is an increase of 14.75 per cent over July, 1928. The first seven months of 1929 showed an increase of 11.66 per cent in net earnings over the corresponding period last year.

Earnings for the twelve months ended July 31 were as follows:

Gross earnings...	$144,337,403	$132,129,195
Oper. expenses...	70,783,092	66,869,864
Gross income...	$73,554,310	$65,259,330
Fixed charges....	43,341,874	40,468,147
Net income.....	$30,212,436	$24,791,183
Provision for retirement res....	8,820,294	8,420,761
Balance	$21,392,142	$16,370,422

Seaboard Utilities Announces New Issue

An issue of 1,000,000 shares of the no par common stock of Seaboard Utilities Shares Corporation, an investment trust specializing in utility stocks, has just been sold by a banking syndicate. The corporation was formed under the laws of Massachusetts and the stock is listed on the Chicago Stock Exchange.

Seaboard Utilities Shares Corporation now owns and will acquire additional securities of electric power and gas companies and of holding companies owning shares of utilities serving the territory principally east of the Mississippi, and all proceeds received from the sale of these common shares will be devoted to the purchase of securities of this type.

Officers and directors of the new corporation include twenty members of the leading public utility banking interests in various financial centers of the country and a like number of electrical manufacturing, utility operating and holding company executives.

New Financing in August Totaled $31,530,000

Electric light and power companies of the country brought out new issues totaling $31,530,000 during the month of August, as compared with $49,650,000 in July and $66,465,000 in August of 1928. Only six companies participated in the month's activities and the largest individual offering was made by the Southern California Edison Company in the form of 5 per cent refunding mortgage gold bonds priced at 98 and interest, yielding 5.14 per cent. This relatively small volume of new financing is not unusual in this season of the year and was by no means confined to the utility field. In the general market a slump occurred, and outside of large investment trust issues, there was reflected a virtual absence of demand for new securities. The average rate of return yielded the investor declined from 5.98 per cent in July to 5.57 per cent in August. The eight-month period closed with new financing totaling $664,580,000, as compared with $827,200,852 for the similar period of 1928.

Customer-Ownership Sales of Stock $11,450,000 in June

According to statistics received by The ELECTRICAL WORLD from central-station companies selling stock directly to customers, employees and local parties, it is estimated that during June 125,000 shares of stock were sold, having a value of $11,450,000, in 20,000 transactions. This value is less than that of May by more than $4,000,000, and the proportion between standard and low-priced shares was somewhat different. Sales in the twenty-five-dollar group fell from more than $6,000,000 to less than $500,000, while those in the $100 class increased by nearly $2,000,000.

This raises the average per share to $92. In the preceding month it was $46. The average transaction amounted to about $573, which may be compared with $460 in May.

Returns show four large campaigns during the month. Two companies report sales of more than $2,000,000 each; one over $1,000,000, and the fourth slightly under that amount.

Summary of sales and monthly averages for the first half year are shown in the accompanying table.

Summary of Customer-Ownership Stock Sales for First Half Year

Month 1929	Transactions	Shares — No.*	Shares — Value*	Average per Share	Dollars per Trans'n
Jan.	24,300	336	$15,833	47	652
Feb.	10,150	80	6,139	77	607
March	9,800	70	5,383	77	547
April	12,350	103	7,470	72	604
May	33,800	342	15,588	46	460
June	20,000	125	11,450	92	573

*Thousands of shares and thousands of dollars.

Pacific Gas Revenues Increase

Pacific Gas & Electric Company is earning at the rate of 8.82 per cent this year in its electric department, according to estimates prepared by Charles E. Crenshaw, assistant gas and electric engineer of the State Railroad Commission. Based on 1928 earnings and the trend of actual earnings of the electric department for the first seven months of 1929, Mr. Crenshaw set the probable gross revenues for this year at $42,750,800, as compared with $39,430,171 in 1928, and net after taxes and depreciation at $21,306,800 for 1929.

The commission engineer's projection of earnings to form estimate for 1929 as compared with actual 1928 figures is of interest. It shows:

	Estimated 1929	Actual 1928
Street lighting	$1,688,000	$1,516,848
Commercial and residential lighting	18,189,300	16,793,142
Commercial and residential heating, etc.	2,085,400	1,619,263
Other power	20,688,100	19,422,167
Miscellaneous revenue	90,000	78,751
Total	$42,750,800	$39,430,171

Engineer's estimate of 1929 production expense is $5,576,000, which with taxes, depreciation and charge-off of uncollectibles brings expense item to $21,444,000.

POTOMAC ELECTRIC POWER CALLS BONDS.—Holders of the refunding 6 per cent mortgage gold bonds, series B, of the Potomac Electric Power Company, due 1953, have been notified that $39,400 bonds of this issue have been called for redemption October 1, 1929 at 107.

FEDERAL LIGHT & TRACTION STOCK LISTED.—The New York Stock Exchange has authorized the listing of $740,000 additional 30-year first lien 5 per cent sinking fund gold bonds of the Federal Light & Traction Company due March 1, 1942, on official notice of sale and issuance to the public. This makes a total applied for of $3,823,500 5 per cent bonds, $3,482,000 stamped 6 per cent bonds, and $4,537,500 stamped 5 per cent bonds.

New Security Issues of Electric Service Companies in August

Name of Company	Amount of Issue, (Par Value)	Period, Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Electric Investors, Inc.	$2,955,000	.....	Preferred stock	To provide funds for acquisition of additional interests in electric light and power companies and for other corporate purposes	6	98¼	6.10
North American Water Works & Electric Corporation	575,000	.....	Common stock, class A	To reimburse the corporation for a portion of the cost of the acquisitions of additional properties and for other corporate purposes	..	23	...
Electric Bond & Share Co.	10,500,000	.....	Cumulative preferred stock	General corporate purposes	6	105	5.70
Central West Public Service Co.	1,000,000	3	Gold notes	To reimburse the treasury for cost of purchased property additions and extensions and for other corporate purposes	7	99¾	7.09
Southern California Edison Co.	15,000,000	25	Refunding mortgage gold bonds	To reimburse the company for a portion of the cost of extensions made to its properties	5	98	5.14
Atlantic Public Utilities, Inc.	1,500,000	1	Secured convertible gold bonds, series A	To refund maturing obligations, to reimburse the company for additions and betterments made to its properties and for other corporate purposes	6	99	7
Total	$31,530,000			Rights	$18,747,000		
Total amount actually realized	$31,693,175			Total financing for August	$50,440,175		

Falling Inventories in Relation to the Depreciation Account*

THERE is much argument in accounting and engineering circles in connection with this thing called depreciation. Many writers and speakers are discussing the point as to whether depreciation should be taken from present reproduction cost or from cost of acquisition. Careful analysis of various statements on these points shows great lack of clear definition of terms, on the one hand, and, on the other, a mentally confused use of the same words in entirely different senses by the same writer or speaker. If more logical thought were insisted on in this discussion, managers would get much more help than they get from much of the current discussion.

So it is evident that the accountant is trying to measure in dollars a financial effect that is produced by some causes, having in mind that this effect has some close connection with replacements of physical assets, and not the mere writing down of figures on books. Otherwise, references to the preservation of the substance of the wealth of an enterprise, replacement of wasting assets and the intimate connection between depreciation costs and the policy of making replacements would not occur to the writer of the book from which these quotations are taken.

But there are some other financial effects as intimately connected with the same assets which also are intimately concerned with the replacement of assets when they are worn out, or are obsolete or inadequate. If depreciation, "from the accounting point of view, deals strictly with the replacement of wasting assets at cost," what will accounting give us to deal with the replacement of the same assets when we must pay more or less for them than they cost when originally installed? That is the financial problem that must be solved by the executive, and its successful solution is at least as intimately connected with his price policy as is depreciation if taken merely from the cost of the asset.

If prices of commodities were stable, if a building built in 1896 could have been replaced in 1920 for the same amount of money, accounting for original costs would automatically account for values. But, unfortunately, all price index curves going back to 1812 and coming up to 1929 show very wide fluctuations in prices of commodities, or, conversely, in the purchasing power of the dollar. These fluctuations inject into the business man's problem certain dollar facts that some accountants seem to insist must not be dealt with by the accountant.

Progressive accounting does not ask business men to set up another set of books to be operated by a different staff alongside of the "conservatives." It is much more practical to employ a progressive accountant who is able to keep value accounts as well as original cost accounts, and who makes accounting entries that tell the truth, the whole truth, both as to costs and values.

Current expenditures for labor and material and all out-of-pocket overheads are of course made in dollars of current purchasing power, and they are so recorded as a matter of every-day routine, without any more thought on the part of the progressive accountant than is given to them by the "conservative." The current purchase price of materials and labor generally serves very well as a unit in which to measure the cost of items that pass through a plant relatively quickly.

But this is not always the case even for working inventories. When prices rose very rapidly between 1916 and 1920, and then fell very rapidly in 1921, both these rapid price movements created some very serious financial effects that should be shown in accounts, the downward movement of 1921 being quite the reverse of that of the previous three or four years. Even "conservative" accounting takes cognizance of these effects when prices fall. This is not done as a matter of principle by most accountants, but purely because some men, without giving it very much thought, call it "conservative" accounting.

"Conservative" accounting says inventories should be valued at cost or market, whichever is the lower. Therefore, if the prices of materials on hand have fallen during their period of retention in the plant, "conservative" accountants abandon the cost principle and go over to the value principle. "Conservative" accountants dimly see that the marked financial effect of falling inventory prices ought to be reflected in their accounts. But they seem to be unable to recognize the financial effects of rising prices, even on inventories.

Those who believe in accounting for values as well as accounting for original costs insist that owners and executives should have both cost and value facts in all cases. They see no logic in recording only the less important fact of original cost during periods of rising price and excluding from the record the more important fact of increased values in such periods. Nor do the progressive accountants lose sight of less important facts of original cost when prices are falling and record at those times only the more important facts of present values. They believe in showing both facts at all times and for all kinds of assets, whether current or fixed.

From a recent address by Ernest F. DuBrul, general manager National Machine Tool Builders' Association.

SOUTHEASTERN INDIANA POWER COMPANY ORGANIZED. — The Southeastern Indiana Company has filed papers with the Secretary of State in Indianapolis under the new incorporation laws enacted by the last Legislature. The incorporators are Charles T. DeHore, Indianapolis; L. E. Eastman, Toledo, Ohio; Donald L. Smith, Indianapolis; Alvin M. Miller and W. M. Frazee, Rushville, Ind. The corporation has an initial capital stock of 5,000 shares of preferred stock with a par value of $100 each and 5,000 shares of common stock of no par value. The company is a subsidiary of the Indianapolis & Southeastern Traction Company and provides electric light and power to a number of cities served by the traction company.

Current Earnings Reports of Electric Light and Power Companies

	1929	1928	Per Cent Increase	Operating Ratio 1929	Operating Ratio 1928
Carolina Power & Light (Year ended June 30)					
Gross earnings	$9,259,876	$8,945,636	4.0	45	52
Net earnings	5,047,421	4,268,362	18.0	..	..
Cities Service (Year ended July 31)					
Gross earnings	39,175,751	33,267,230	17.7	..	..
Net earnings	37,961,997	32,136,624	18.1	..	..
Columbia Gas & Electric & subs. (Year ended June 30)					
Gross earnings	111,263,170	101,776,637	9.3	50	49
Net earnings	56,072,372	52,138,899	7.5	..	..
Consumers Power (Year ended July 31)					
Gross earnings	32,690,219	28,712,549	13.8	49	50
Net earnings	16,547,455	14,214,707	16.4	..	..
Detroit Edison (Year ended July 31)					
Gross earnings	55,629,312	49,889,460	11.5	65	66
Net earnings	19,305,013	16,969,337	13.8	..	..
Kansas City Power & Light (Year ended July 31)					
Gross earnings	$14,282,798	$13,406,084	6.5	51	51
Net earnings	6,986,720	6,555,455	6.6	..	..
Nevada-California Electric & subs. (Year ended July 31)					
Gross earnings	5,563,998	5,331,938	4.4	47	43
Net earnings	2,960,400	3,054,593	—3.1	..	..
Southern California Edison (Year ended July 31)					
Gross earnings	37,787,551	33,007,508	14.0	34	33
Net earnings	24,811,418	22,217,085	12.0	..	..
Tennessee Electric Power & subs. (Year ended July 31)					
Gross earnings	14,034,053	12,983,519	8.1	51	54
Net earnings	6,879,638	6,041,261	13.9	..	..

Business News and Market Conditions

N.E.M.A. Frowns on Comparison of Refrigerants

Urging dealers and distributors to avoid discussing the relative merits of refrigerants, members of the Refrigeration Division of the National Electrical Manufacturers' Association unanimously adopted a resolution condemning destructive advertising and selling methods at a meeting held in Cleveland early in August. The resolution reads as follows:

Whereas the manufacturers of mechanical refrigerators are collectively interested in creating the largest possible group of prospective purchasers of their product and to share in the business so created according to their individual merits, and,

Whereas any expedient that may be adopted by individual manufacturers which may cause the public to question the merits of mechanical refrigeration of any type and thereby tend to diminish the total volume of refrigeration sales is harmful to the industry generally and in the last analysis to the individual manufacturers,

Therefore, be it resolved, that the Refrigeration Division of the N.E.M.A. does not approve selling or advertising policies or any other expedient which encourages discussion of the relative merits of the various types of refrigerants, and,

Be it further resolved, that the members of this organization will use every means at their disposal to urge their distributors and dealers and all employees of such organizations to act according to the spirit and the letter of this resolution.

Half Year's Exports Show 33 per Cent Gain

Exports of electrical equipment from the United States during the first half of 1929 showed a gain of 33 per cent over the first half of 1928, reaching a total of $70,788,339.

Gains were very widely distributed throughout the list, but outstanding increases are recorded in the case of transmission and distribution apparatus, motors, especially stationary motors from 100 to 200 hp., and accessories and parts for motors. Radio apparatus exports also advanced sharply, as did also insulated copper wire and cable. Figures for the two periods follow.

Copper Buyers Stampede for Record Tonnage

All records were broken for copper buying this week, when domestic buyers entered the market for close to 100,000 tons, which far surpasses the previous record of about 56,000 tons sold in the week ended December 26, 1928, which, curiously enough, was also a holiday week. About 35,000 tons of this was sold in one day, since when inquiry has tempered somewhat, and also the willingness of producers to sell.

Foreign business has also been active.

NEW YORK METAL MARKET PRICES

	Aug. 28, 1929 Cents per Pound	Sept. 4, 1929 Cents per Pound
Copper, electrolytic	18	18
Lead, Am. S. & R. price	6.75	6.75
Antimony	9.00	8.75
Nickel, ingot	35	35
Zinc, spot	7.15	7.15
Tin, Straits	46.00	45.88
Aluminum, 99 per cent.	24.30	24.30

Electrical Exports for First Half of 1928 and 1929

Article	Six Months Ended June 30 1928	1929
Generators:		
Direct-current—		
Under 500 kw.	$604,660	$602,001
500 kw. and over	433,042	364,389
Alternating current—		
Under 2,000 kva.	81,950	119,344
2,000 kva. and over	312,763	.....
Steam-turbo generator sets	327,235	455,298
Accessories and parts for generators	578,400	406,500
Self-contained lighting outfits	568,315	589,217
Batteries:		
Flashlight batteries	1,411,066	1,838,766
Other dry and wet cell primary batteries	1,500,000	.....
Radio B and C batteries (dry)	.....	602,664
Other, not elsewhere specified	.....	880,571
Storage batteries	1,679,605	1,792,357
Transforming or converting apparatus:		
Power transformers, 500 kva. and over	602,135	537,140
Distribution transformers, less than 500 kva	373,419	668,264
Instrument transformers	68,659	92,477
Other transformers, not elsewhere specified	367,588	588,878
Complete battery chargers under 15 amp	126,422	132,607
Rectifiers, double-current and motor generators, dynamotors, synchronous and other converters	684,607	561,269
Transmission and distribution apparatus:		
Switchboard panels, except telephone	905,373	671,763
Switches and circuit breakers over 10 amp.	815,193	1,072,851
Fuses and fuse blocks	209,277	311,534
Watt-hour and other measuring meters	476,824	700,985
Recording, indicating, etc. apparatus—		
Electrical indicating instruments	181,648	329,558
Electrical recording instruments	113,919	157,446
Other electrical testing apparatus	418,417	534,499
Lightning arresters, choke coils, reactors, and other protective devices	$390,375	$532,786
Motors, starters and controllers:		
Motors, ¼ hp. and under	1,019,495	1,316,658
Motors, over ¼ and under 1 hp.	481,974	433,189
Stationary motors—		
1 to 200 hp.	1,330,561	2,018,830
Over 200 hp.	199,601	159,932
Railway motors	416,260	198,003
Electric locomotives—		
Railway	712,109	156,792
Mining and industrial	320,557	185,021
Station and warehouse electric motor trucks	98,070	85,377
Starting and controlling equipment—		
For industrial motors	803,540	1,002,321
For electric railway and vehicle motors	119,769	88,299
Portable and electric tools	664,150	.....
Portable electric tools, except automotive	.....	708,423
Automotive electric machine tools	.....	28,576
Accessories and parts for motors	1,141,274	1,710,951
Electric appliances:		
Electric fans	489,580	615,041
Electric lamps—		
Metal filament	722,433	673,418
Other electric lamps	267,182	307,885
Flashlights	1,389,772	1,437,888
Searchlights and projectors	293,849	303,677
Motor-driven household devices—		
Electric household washing machines	867,174	961,863
Elec. vacuum cleaners	729,550	672,993
Other motor-driven devices, except tools	486,821	586,578
Electric flatirons	145,431	199,817
Domestic heating and cooking devices—		
Electric cooking ranges	148,476	199,530
Other domestic heating and cooking devices	430,342	483,373
Industrial electric furnaces and ovens	153,509	221,505
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries	829,736	991,809
Signal and communication devices:		
Radio apparatus	$4,342,809	$7,799,811
Telegraph and telephone apparatus	2,128,016	3,064,985
Railway signals, switches, and attachments	360,267	444,074
Bells, buzzers, annunciators and alarms	212,534	173,511
Other electric apparatus:		
Spark plugs	555,444	1,231,137
Other starting, lighting, and ignition equipment	598,190	992,170
Insulating material	649,029	684,653
Metal conduit, outlet and switch boxes	708,873	710,500
Sockets, receptacles and lightning switches	965,253	1,144,781
Electric interior lighting fixtures	991,765	1,365,262
Electric street lighting fixtures	245,268	325,124
Other wiring supplies and line material	468,155	692,253
Other electrical apparatus not elsewhere specified	3,803,599	6,680,166
Rubber and friction tape	225,809	262,639
Globes and shades for lighting fixtures	303,653	385,683
Electrical glassware except for lighting	198,792	264,575
Electrical porcelain:		
For less than 6,600 volts	322,267	412,675
For 6,600 volts and over	337,236	476,754
Carbons, carbon brushes and electrodes:		
Electrodes for electric furnaces	1,213,127	1,153,834
Other carbon products	368,819	504,845
Insulated wire and cable, iron or steel	115,146	218,718
Copper, bare wire	1,148,845	1,871,252
Copper, insulated wire and cable	2,311,459	3,392,393
Refrigeration sets up to 1 ton capacity	3,200,176	.....
Refrigeration sets up to ½ ton capacity	.....	5,274,034
Refrigeration sets over ½ to 1 ton capacity	.....	981,597
Totals	$53,266,866	$70,788,339

Market Conditions

ELECTRIC railway buying assumes distinct importance this week, especially in the Eastern district, and several branches of the manufacturing industry are benefiting.

——WIRE ORDERS HAVE BEEN SUBSTANTIAL in the Southeast and small motor orders are a feature in New England.

——INDUSTRIAL PLANT DEMAND WAS EXCEPTIONALLY GOOD in the St. Louis area and substation equipment demand was up substantially.

——PACIFIC COAST BUSINESS IS SATISFACTORY in total volume but large orders are exceptional. Copper wire is in active demand.

EASTERN

BUSINESS in the Eastern district continues to swing in the right direction. Electric railway account is reaching a peak level, with commitments developing record figures. Practically all primary branches of the electrical industry are sharing in the demand from that quarter. Industrial transactions are showing increased range and some volume sales are in sight for motors, controls and kindred apparatus. Central station call is active, with all indications pointing to good fall commitments.

Two record orders have been placed for equipment for railway electrification work. The Delaware, Lackawanna & Western Railroad Company has contracted for about 903 miles of wire and cable for its program in New Jersey covering 903 miles of track, the business being divided between the Anaconda Wire & Cable Company, New York, Bridgeport Brass Company, Bridgeport, Conn., American Electric Works, Inc., Phillipsdale, R. I. and the Standard Underground Cable Company, a division of the General Cable Company, New York. The New York Central Railroad Company has placed orders for oil battery electric locomotives for switching service with the American Locomotive Company and General Electric Company, totaling $4,500,000.

Central station account is of varied character, with substation equipment showing the more promising tendencies. A metropolitan power company has given a commitment for switchgear to an amount of $400,000 to a New York manufacturer. A Pennsylvania producer will supply equipment for six switching stations for a Florida power interest. Municipal demand is active for power station equipment and several sizable contracts are expected to be closed at an early date. A manufacturer of generators in Pennsylvania has secured an award for two 1,500-kw. units from a Western city, the contract for two 2,900-hp. water turbines being placed with a Philadelphia maker, and a New York manufacturer taking an order for a battery of eight 1,667-kva. transformers, totaling $47,-061. A municipality in Virginia has awarded a contract to an Illinois maker for a Diesel engine unit for city power service. Wire and cable business is showing improvement and fall account gives promise of an appreciable turnover. Construction projects follow:

The Brooklyn Edison Company, Brooklyn, N. Y., will build a general equipment and service plant to cost more than $1,000,000, with facilities for company motor fleet. The Dry Ice Corporation, New York, plans an expansion program, including new plants in the South and on the Pacific Coast to cost in excess of $350,000. The Donner Steel Company, Buffalo, N. Y., plans steel finishing mill to cost $2,000,000. The Standard Oil Company of New York, Inc., contemplates an oil storage and distributing plant on Staten Island to cost more than $600,000. The Bresee Chevrolet Company, Syracuse, N. Y., plans an automobile service, repair and garage building to cost $175,000. The Roessler & Hasslacher Chemical Company, Niagara Falls, N. Y., plans an addition to cost about $40,000. The Mercy Hospital, Auburn, N. Y., plans a power plant to cost more than $80,000. The Curtiss Airports Corporation, New York, plans an air base with large group of buildings at San Francisco, Calif., to cost about $2,000,000. The Seal Lock Burial Vault Company, Richmond Hill, L. I., plans plant to cost about $50,000. The Standard Underground Cable Company, Pittsburgh, Pa., will build an addition to its plant at Perth Amboy, N. J., to cost about $65,000. The Croce Bottling Works, Inc., Asbury Park, N. J., will build an addition to cost $60,000. The Matawan Tile Company, Matawan, N. J., plans rebuilding of portion of plant recently destroyed by fire with loss of about $100,000. The John A. Roebling's Sons Company, Trenton, N. J., will proceed with superstructures for additions to plants at Trenton and Roebling, N. J., to cost more than $125,000.

The Pennsylvania Railroad Company, Philadelphia, Pa., will build a freight terminal at Harrisburg, Pa., to cost $100,000. The Philadelphia Reading Railway, Philadelphia, has filed plans for an electric car repair shop at Wayne Junction to cost more than $350,000. I. Fischman & Sons, Philadelphia, Pa., are asking bids on general contract until September 15 for a plant for soda fountain manufacture to cost close to $1,300,000. The State Teachers' College, East Stroudsburg, Pa., plans extensions and improvements in power plant to cost $50,000. The Starlight Refining Company, Karns City, Pa., plans rebuilding of portion of oil refining plant recently destroyed by fire with loss of $75,-000. The Pittsburgh Plate Glass Company, Pittsburgh, Pa., will build a plant at Santa Ana, Calif., to cost $4,000,000. The Baltimore & Ohio Railroad is building is building a coal-handling plant.

NEW ENGLAND

SMALL orders in good volume were placed during the past week by manufacturers of electrical equipment in this district. Small motor sales continue to maintain a steady trend. Inquiries continue regularly and little evidence of slackening is in sight. Small switch and control apparatus sales are active. The trend in general scheduled materials is fair.

Orders for new construction materials are encouraging; wire, wiring devices, cable and hardware sales are good, though an early slacking is forecast due to some dullness in new construction interest for the coming fall. Heavy industrial equipment sales are pending; a number of large orders for substation and power generation are in sight and will be closed soon. On September 9 the State of Maine will vote on the question of power exportation; if the result is favorable to exportation, a program involving many millions in power development and distribution will very likely be launched. Construction projects follow:

Boston, Mass., plans power plant at Mattapan Hospital to cost $100,000. The Boston Elevated Railway Company, Boston, Mass., has filed plans for a power substation at Watertown, reported to cost $30,000. The Edison Electric Illuminating Company, Boston, Mass., has plans for a power substation at Woburn, Mass., reported to cost $45,000. The Pawtucket Standard Braid Company, Pawtucket, R. I., plans an addition reported to cost about $50,000. The Hartford Electric Light Company, Hartford, Conn., plans a substation in the vicinity of Market Street. New Haven, Conn., plans floodlighting system and beacon lamps to proposed municipal airport, entire project reported to cost more than $60,000. The Southern New England Ice Company, New London, Conn., plans ice-manufacturing plant with initial capacity of 75 tons per day, reported to cost $130,000.

SOUTHEAST

INQUIRIES rather than orders were the outstanding features of electrical business in the South east last week. With few exceptions neither central stations nor industrials placed anything but small-sized orders but the general volume was reasonably satisfactory.

One company placed an order for 60,000 lb. of numbers four, six and eight bare and weatherproof copper and another order for 60,000 lb. of numbers two and eight bare and weatherproof copper. An order for two carloads of bare and weatherproof copper wire will be placed this week by a Carolina power company. Some other central station orders were for $8,200 worth of transformer equipment and $3,000 worth of creosoted pine poles. One order in immediate prospect

is $100,000 of cable for a semaphore system in Birmingham. A Georgia textile plant ordered condenser equipment approximating $16,000, while another plant in the same state ordered $7,000 worth of textile motor and small switchboard equipment. Some other industrial orders were for $4,000 of mill wiring supplies and $3,500 of mill village wiring equipment. A small privately owned resort system in Georgia was responsible for an order for $5,000 of distribution equipment placed last week. Some very satisfactory street lighting equipment business is in prospect in New Orleans and will undoubtedly be placed this week.

The Smith-Douglas Company, Norfolk, Va., plans a fertilizer plant at Danville, Va., to cost about $60,000. Charlotte, N. C., plans extensions in street lighting system. Sanford, N. C., contemplates a municipal electric light and power plant, reported to cost close to $50,000. The Kraft-Phoenix Cheese Company, Chicago, Ill., plans cheese factory and milk condensory at West Jefferson, N. C., to cost $100,000. Anderson, S. C., plans floodlighting system at proposed municipal airport to cost $50,000. The Laurens Cotton Mills, Inc., Laurens, S. C., plans addition to cost $100,000. The Mississippi Power & Light Company, Jackson, Miss., will make extensions and improvements in transmission lines and distributing system at Greenville, Miss., to cost about $30,000. The Tennessee Coal Iron & Railroad Company, Birmingham, Ala., plans basic slag plant to cost $150,000. The Interstate Utilities Corporation, State Line, Miss., plans transmission line to Fruitland, Yellow Pine, Ala., and vicinity. Flagler Beach, Fla., plans floodlighting system at proposed municipal airport, reported to cost about $50,000. The Florida Public Service Company, Orlando, Fla., plans power substation at Winter Garden, Fla., to cost close to $60,000.

Southwest

Industrial plant demand during the month of August in the St. Louis territory has been exceptionally good. The volume of line and substation construction materials moved has been 10 to 15 per cent above that of last August. The outlook for steadily expanding business is regarded as exceptionally good.

Contracts reported closed during the past week include two 300-kw. generators for oil engine connection to cost $6,000, a 1,000-hp. motor for motor-generator set with control for $5,000 and substation equipment for the western part of the district worth $10,000. Jobbers and the smaller manufacturers agree that they have gone through the summer months with good steady business well above normal. Construction projects follow:

The Universal Aviation Corporation, St. Louis, Mo., plans floodlighting system and beacon lamps at proposed airport at Granite City, Mo., to cost $80,000. The Kansas City Car Company, Kansas City, Mo., plans plant at North Kansas City, to cost $150,000. The Skaggs-Safeway Stores, Inc., Kansas City, Mo., plans bakery and coffee plant to cost $200,000. Macon, Mo., plans floodlighting system at proposed municipal airport. The Mexico Refractories Company, Mexico, Mo., plans firebrick plant to cost about $65,000. The Krey Packing Company, St. Louis, Mo., plans meat-packing plant to cost $275,000. The Mack International Truck Corporation, St. Louis, Mo., has filed plans for factory branch, service and repair plant to cost $230,000. The Western Air Express, Alva, Okla., plans floodlighting system at proposed airport, entire project to cost $70,000. Fairview, Okla., is arranging bond issue of $30,000 for extensions and improvements in municipal electric transmission and distributing system. The Oklahoma Gas & Electric Company, Oklahoma City, Okla., has plans for a steam-operated electric generating plant with capacity of 30,000 kw., to include power substation and transmission line, reported to cost $650,000. The Mitchell & Mitchell Manufacturing Company, Fort Smith, Ark., plans rebuilding of portion of spring-manufacturing plant, recently destroyed by fire with loss of $200,000. Fort Worth, Tex., plans floodlighting system and beacon lamps at proposed municipal airport, reported to cost $70,000. Little Rock, Ark., plans installation of municipal fire alarm system, reported to cost $70,000. Morrillton, Ark., plans municipal power plant to cost about $50,000. The Houston Armature Works, Inc., Houston, Tex., plans plant to cost $45,000. Paris, Tex., plans municipal ice plant, reported to cost about $30,000. The Central Power & Light Company, San Antonio, Tex., plans extensions in power substation at Uvalde, and will build new substation at Rock Springs, Tex., with extensions in transmission lines, reported cost $80,000.

Pacific Coast

Business on the Pacific Coast is keeping up exceptionally well for this time of the year and prospects for the future are good. The situation in the fruit section of California is better than that which appeared earlier in the season and the general outlook is consequently more optimistic. Central station business is about normal and several of the large utilities are in the market quite frequently for copper wire and cable but not for large amounts. The advance of ¼ cent per pound undoubtedly will stimulate copper purchases as it indicates quite clearly the trend after a long period during which there was no change in prices.

Westinghouse reports a sale of voltage regulators to the Los Angeles Department of Water and Power for $25,000 and an order for ten elevators amounting to approximately $200,000 for the Seattle County Hyphen City Building. General Electric has received an order from the Modesto Irrigation District for a switch house totaling about $2,000. Business with it was quiet last week but prospects are good. Jobbers report a moderate amount of business being placed but nothing of unusual size or importance.

Motor and apparatus orders in Seattle and Puget Sound district last week included one eight-panel truck type switchboard for Fremont substation from Condit Electric Mfg. Co. for $15,000 by city of Seattle; one 6,000-kva., three-phase, 60 cycle, 13,200 to 2,300 (4,000 Y-connected) volt self-cooled transformer by the city of Tacoma from Maloney Electric Co., for $13,295. The city of Seattle bought 25,000 ft. of 600-volt R.C. copper wire for $4,056. One dealer reported the sale of eight pumps from 500 to 600 gallon capacity, equipped with 50-hp. motors, and also twenty machines from 100 hp. down; another 40 motors from 40 hp. down to lumber mills and woodworking plants; another a 500-hp. motor for a pulp mill in southwest Washington and 30 machines from 75 hp. down to mills, industrials and dealers. The city of Centralia about middle of September expects to issue specifications for disconnecting switches and oil circuit breakers for municipal plant under construction. Pole and pole line hardware sales are reported extremely light with no indications of immediate betterment. The street lighting system in Pasco, Wash., has ordered 72 Westinghouse granite poles costing $12,400. Bids for lighting Spokane's airport will be taken soon. Construction of a pulp mill of 500 tons daily capacity and sawmill with 1,000,000 board feet daily capacity for Olympic Forest Products Co. at Port Angeles will start in October. Construction projects follow:

The Pacific Electric Railway Company, Los Angeles, Calif., plans car shops and terminal at Long Beach, Calif., reported to cost more than $200,000. The Los Angeles Brush Company, Los Angeles, Calif., plans addition to cost $40,000. The California Chemical Corporation, Newark, Calif., has approved plans for plant to cost $85,000. San Francisco, Calif., plans installation of floodlighting system in connection with extensions at Mills Field municipal airport, entire project to cost $75,000. Whittier, Los Angeles and Gustine, Calif., plan ornamental lighting systems. The Umpqua Pulp & Paper Company, Gardiner, Ore., plans pulp and paper mill to cost about $2,000,000. The Spring Street Iron Works, Klamath Falls, Ore., plans rebuilding of portion of mill, recently destroyed by fire with loss reported at $100,000. The California-Oregon Power Company, Medford, Ore., plans power substation to cost about $100,000. Chehales, Wash., plans ornamental lighting system. The Puget Sound Pulp & Timber Company, Everett, Wash., has approved plans for a pulp and timber mill to cost $2,500,000. The Willapa Pulp & Paper Company, Portland, Ore., plans mill at Raymond, Wash., to cost more than $1,000,000. The Aircraft Plywood Company, Seattle, Wash., has filed plans for plant unit to cost $120,000. Anaconda, Mont., will soon take bids for ornamental lighting system. Las Vegas, Nev., plans ornamental lighting system on several streets. Chandler, Ariz., plans ornamental lighting system. The Phoenix Central Produce Terminal Company, Phoenix, Ariz., plans plant to cost $125,000.

Middle West

Business conditions in the Middle West generally continue at a higher level than a year ago. Manufacturing productions are satisfactory and the effect of harvest time is beginning to be apparent in agricultural buying and other activities. Wholesale

and retail trade continue to recover from hot-weather seasonal declines and are well above 1928.

In specific regard to electrical and related business there are instanced orders in a single group for power plant equipment last week totaling about $420,000. Of this, $338,000 was for condensing equipment and auxiliaries, traveling screens $28,000, draft fans $32,000 and motor drives $30,000. Electrical apparatus in general is active. Preliminary negotiations for large amounts of copper in cable and wire are now being made.

The Cohodas Brothers Company, Green Bay, Wis., plans cold storage and refrigerating plant at Antigo, Wis., to cost about $25,000. The Lake Superior District Power Company, Ashland, Wis., plans a transmission line from Park Falls to Medford. The Badger Zinc Company, Platteville, Wis., plans zinc mill near Linden, Wis., to cost $60,000. The Consolidated Water Power & Paper Company, Wisconsin Rapids, Wis., will build an addition to paper mill to cost about $100,000. The Packard Motor Car Company, Detroit, Mich., has filed plans for a power plant to cost more than $350,000. The Lyon Metal Products Company, Aurora, Ill., plans power plant to cost $70,000. The Edison Appliance Company, Chicago, Ill., has filed plans for a two-story addition to cost about $70,000. The Great Lakes Varnish Works, Chicago, Ill., plans addition to cost $60,000. The Illinois Anthracite Corporation, Chicago, will build a coal treatment plant to cost $750,000. The International Harvester Company, Chicago, Ill., has approved plans for steel wheel plant at Rock Island, Ill., to cost $250,000. The Northwestern Barb Wire Company, Sterling, Ill., plans power plant to cost $45,000. The Edwards Iron Works, South Bend, Ind., plans addition to steel fabricating plant to cost about $60,000. The Cleveland Electric Illuminating Company, Cleveland, Ohio, has filed plans for an addition to Clinton substation to cost about $45,000. The Dayton Power & Light Company, Dayton, Ohio, has filed plans for addition to power plant to cost $300,000. The Darmer Milk Company, Greenville, Ohio, plans rebuilding of portion of plant, recently destroyed by fire with loss of about $50,000. Milnor, N. D., is having plans for ornamental lighting system. The Central West Public Service Company, Omaha, Neb., has approved plans for extensions in power plant at Woonsocket, S. D., reported to cost close to $100,000. Fairfax, Minn., plans ornamental lighting system in the business district. The Republic Creosoting Company, Minneapolis, Minn., plans addition to cost $90,000. Brown & Bigelow, Inc., St. Paul, Minn., plans addition to engraving and printing plant to cost $100,000. Cedar Rapids, Iowa, contemplates floodlighting system at municipal airport, entire project to cost $180,000.

Activities of the Trade

Westinghouse Receives Libbey Owens Order

The Libbey Owens Sheet Glass Company of Toledo, Ohio, has recently purchased from Westinghouse Electric & Manufacturing Company an addition for its East Broadway plant. The electrical equipment involved consists of an extension to the present 69,000-volt outdoor substation comprising a 6,000-kva., 69,000/66,000-volt, three-phase transformer bank and a 73-kv. oil circuit breaker, together with the necessary disconnecting switches, lightning arresters, insulators, busbars and other auxiliary equipment. This more than doubles the capacity of the present outdoor substation. There were also added for the low-tension connections in this outdoor substation four weatherproof outdoor switchhouses for the 6,600-volt feeders to the secondary substation and for the 6,600-volt bus tie circuits. Two other weatherproof outdoor switchhouses were also supplied to replace two present switchhouses, due to the fact that the breakers in the present switchhouses are of insufficient capacity because of the recent increase.

At the same time a 6,000-kva., three-phase transformer bank, 6,600/460 volts, for the secondary substation was purchased. With this equipment four 15,000-volt oil circuit breakers for indoor mounting were also supplied. Each of the breakers was mounted in a sheet-steel cubicle, which will be supplied complete with current transformers, bus supports, disconnecting switches and necessary bus equipment, all of which will be completely erected and tested at the factory before shipment. For the 460-volt low-tension circuits there were purchased two type "F-22" oil circuit breakers and six type "B-2" oil circuit breakers, which are mounted in welded angle-frame structures and are erected complete with disconnecting switches, current transformers and busbar equipment at the factory and shipped complete, ready for installation. In both the above cases the customer is using the latest type of apparatus for this application and is eliminating practically all of his erection work by purchasing the unit complete from the factory and ready for installation.

Oil-Electric Locomotive Order

The American Rolling Mill Company has just ordered two more 300-hp. oil-electric locomotives for use in its Ashland (Ky.) plant. These units are to be duplicates of the four already in service and are built jointly by the Ingersoll-Rand Company, General Electric Company and the American Locomotive Company.

Many oil-electric locomotives are now in constant service on railroads and in industrial plants throughout the country. Their fuel, operating and maintenance costs are very low, and they are performing service over 90 per cent of the calendar hours in the year, according to the Ingersoll-Rand Company.

THE WAGNER ELECTRIC CORPORATION, St. Louis, announces the transfer of F. C. Hosimer from the St. Louis home office to the Chicago branch sales office, where he will represent the company as a salesman. Mr. Hosimer graduated from Purdue University in 1925, upon which he entered the Wagner organization as a student engineer. Upon completion of the Wagner training course he became a sales correspondent, which position he filled until his recent transfer to Chicago.

THE CHAMPION SWITCH COMPANY, Kenova, W. Va., announces removal of its New York office from 2 Rector Street to 140 Cedar Street, where increased space and facilities have been secured.

THE RELIANCE MANUFACTURING COMPANY, Massillon, Ohio, will construct a substantial addition to its factory facilities in order to take care of its increasing business in the lock washer field and to provide additional floor space for a new but closely allied line which will allow the company to enter new fields, it is announced by officials of the company. The new line of products will be adaptable for practically all fabricated steel manufacturing processes, it is stated.

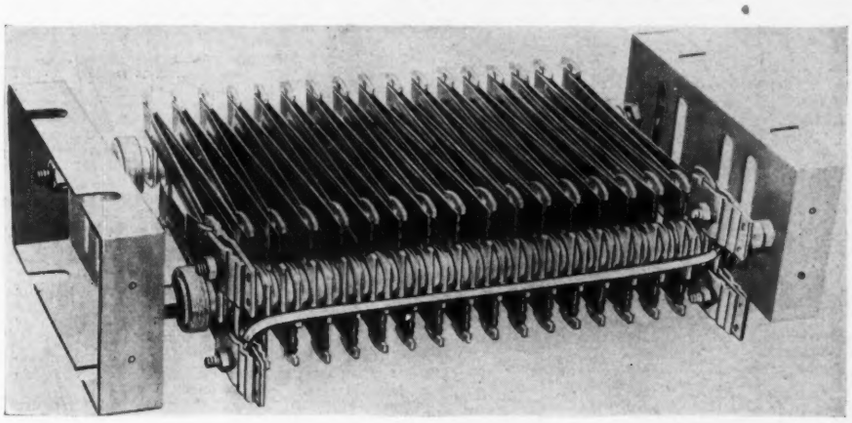
THE INCA MANUFACTURING CORPORATION has recently been organized at Fort Wayne, Ind., by George A. Jacobs, founder and former president of the Dudlo Manufacturing Company, and his associates. The new concern was formed to manufacture copper wire products for the electric, radio, automotive and kindred industries. Offices have been established and construction of a large plant is well under way on the 11-acre factory site purchased. The plant will be in operation within the next few weeks. Officers of The Inca Manufacturing Corporation are: George A. Jacobs, president; Wendell C. Glass, vice-president; George W. Spindler, secretary-treasurer, and S. A. Jacobs, in charge of sales.

STEEL & TUBES, INC., Cleveland, Ohio, has recently opened a new welded steel tubing plant at Ferndale, (Detroit) Mich. This plant is a model tube plant costing over $1,000,000, including equipment. The Ferndale unit will take the place of a former plant at Toledo, Ohio, but will be much larger in order to take care of increased business. It is especially advantageously located for the huge automotive markets of Detroit and surrounding territory. When in complete operation the plant will employ from 250 to 300 men and will have an estimated output of more than 3,000,000 ft. of steel tubing per month. The building is 537 ft. long by 211 ft. wide, containing slightly over 2½ acres of manufacturing floor space.

New Equipment Available

Unbreakable Resistor

A new unbreakable resistor under the trade name "Dur-ristor," which has a continuous resistance element, is announced by Cutler-Hammer, Inc., Milwaukee, Wis. Designed to meet the need for a resistor which would give maximum service under the most severe operating conditions, it includes such advantages as being vibration-proof and unbreakable, non-corrodible, light and compact. The main body, namely, the resistance element, consists of two continuous unbreakable strips. These strips are made



of rust-proof, non-corrodible alloy. They are proportionally ribbed on the sides as well as on the turning edges.

A new method of supporting the strips, combined with the ribbing, permits the strips to expand and contract freely during temperature changes. The entire resistor is made unbreakable by the elimination of brittle material and by the use of mica for all insulation, according to the manufacturer.

Armored Cables with Large Diameters

Power and control cable with interlocked, flexible metal armor for installation without a conduit in central-station, industrial and other interior wiring has been announced by the General Electric Company. Cable provided with the armor can be run along walls, between partitions and under floors without the use of ducts, and the construction of the armor is such that turns in the cable can be made easily.

Varnished cambric and rubber-insulated, either taped, braided or leaded, and paper-leaded cable can be supplied with the armor, in lengths up to 1,000 ft. for cables with an over-all diameter less than 1 in. and in lengths up to 2,000 ft. for cables with an over-all diameter between 1 and 3 in.

The armor is a layer of overlapping and interlocking metal tape, either galvanized steel or aluminum, so applied that the cable is always mechanically protected under reasonable installation conditions. The steel armor is suitable for most installations; the aluminum tape is for use where a non-corroding armor is required, and for single-conductor cable carrying alternating current where the magnetic effect of steel is undesirable.

Metal Has Great Strength at High Temperatures

The development of a new metal, known as "Konel," which is credited with being much stronger than other metals at high temperatures and which can be used extensively in the moving parts of internal-combustion engines and other extremely hot places, is announced by the officials of the Westinghouse Electric & Manufacturing Company.

Originally developed by the Westinghouse research laboratories as a substitute for platinum in the manufacture of filaments for radio tubes, the new metal was discovered to be harder to forge than steel and to be very tough at high temperatures.

Platinum costs approximately $180 per ounce, while the new substance costs only a few dollars a pound.

Tap Grinder Has High-Speed Regulation

A new tap-grinding machine, driven by a specially designed 1¼-hp. Westinghouse type SK motor, for grinding tap flutes by the use of a taper arbor on the end of a spindle, using various sizes of grinding wheels, is announced by the J. G. Blount Company, Everett, Mass. For the grinding of small taps, wheels of small diameter and width are used, while on the larger taps grinding wheels of 6-in. diameter are employed.

The grinders are self-contained, being driven by a special direct-connected, totally inclosed ball-bearing motor with a speed range of 4,000 to 7,000 r.p.m. The motor is controlled by a field rheostat so that any grinding speed may be obtained up to 7,000 r.p.m. A smooth finish can be obtained by the inherently close speed regulation of the driver.

Electric Furnace for Heat-Treating Aluminum Alloys

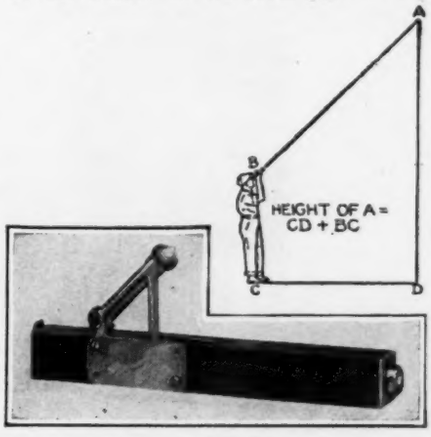
A new electric furnace specially designed to heat-treat aluminum alloys is announced by the General Electric Company. The new furnace is a pit type, cylindrical unit, having two circuits. One is rated at 220 volts, three-phase, and has a Y series connection in the top; the other circuit in the lower side walls and bottom, is rated 220 volts, three phase, with a Y-delta connection. At high heat the power consumption is 84 kw. and at low heat 28 kw.

In a typical application of this furnace a run of castings weighing approximately 500 lb. plus a basket weight of 700 lb., both at room temperature, was placed in the furnace at a temperature of 960 deg. F. In 1½ hours the center of the charge was at the heat-treating temperature, although for a third of this time the furnace was operating on low heat. A check showed that the outside of the charge next to the heating units was no higher than 960 deg. F.

In this typical furnace the working dimensions were a diameter of 4 ft. and depth of 6. It was designed to heat a charge weighing 1,500 lb. plus a basket weight of 500 lb. from 600 to 950 deg. F. in one hour and to hold the charge at the latter temperature for twelve hours. The estimated radiation at the holding temperature is 17 kw.-hr. per hour.

Pocket Device Measures Height of Pole

A convenient pocket-sized instrument for computing the height of poles, wires, buildings, etc., has been produced by the W. N. Matthews Corporation, St. Louis, Mo. It is called the type CW Matthews "Teleheight." By merely pointing to the top of the object through the "Teleheight," the height in feet is quickly computed. To find the height of object A, one stands away from the object until the bubble in the level part of the



instrument and the line in the "Teleheight" cross each other. One measures the distance from the object and the height of the eyes from the ground. The sum equals the height of the object.

Electrical Patents

Announced by U. S. Patent Office

(Issued August 20, 1929)

1,724,968. REGULATOR FOR RECTIFIERS; J. C. Schelleng, Millburn, N. J. App. filed Nov. 19, 1924.

1,724,973. TESTING DEVICE; O. A. Shann, Brooklyn, N. Y. App. filed July 24, 1925.

1,724,984. ELECTRIC COMB FOR THE HAIR; E. M. Wildey, London, England. App. filed March 25, 1927.

1,724,989. CONTACTOR DRUM FOR TELEPHONE CENTRAL OFFICE EQUIPMENT; C. C. Barber, Freeport, N. Y. App. filed Aug. 22, 1927.

1,724,999. CONDUIT-OUTLET BOX; W. G. Franke and L. A. Reiner, Detroit, Mich.

1,725,022. ALARM; L. J. Stacy, Caldwell, and M. E. Krom, Madison, N. J. App. filed Sept. 10, 1927.

1,725,026. ELECTROMAGNETIC BODY; R. Swinne, Steglitz, Berlin, Germany. App. filed April 15, 1927.

1,725,028. LIGHTING FIXTURE; N. Ureles, New York, N. Y. App. filed March 25, 1926.

1,725,038. SOUND-RECEIVING APPARATUS; R. L. Williams, Newton, Mass. App. filed Nov. 15, 1924.

1,725,048. ELECTRIC CANDLE; W. A. Black, Montclair, N. J. App. filed Aug. 4, 1927.

1,725,049. TESTING SWITCH; H. J. Blakeslee, Marlboro, Conn. App. filed Aug. 22, 1928.

1,725,051. INDUCTION WATT HOUR METER; W. M. Bradshaw, Wilkinsburg, Pa. App. filed April 29, 1927.

1,725,053. PRODUCTION OF HIGH-TENSION ELECTRIC CURRENTS BY MEANS OF TRANSFORMERS SUCH AS INDUCTION COILS; W. J. Brown, Stockport, and E. Y. Robinson, Manchester, England. App. filed Oct. 4, 1924.

1,725,060. VARIABLE INDUCTOR; R. L. Davis, Pittsburgh, Pa. App. filed Sept. 7, 1926.

1,725,074. RADIO APPARATUS; J. A. Hanson, Hunters, Wash. App. filed Sept. 9, 1924.

1,725,078. TAP CHANGER; L. H. Hill, Swiss Vale, Pa. App. filed March 31, 1926.

1,725,079. SWITCH GEAR FOR STARTING AND CONTROLLING ELECTRIC MOTORS; J. A. Hirst, Chester, England. App. filed Aug. 14, 1923.

1,725,086. COMBINATION IGNITION LOCK; E. V. Larson, New Rochelle, N. Y. App. filed May 21, 1927.

1,725,097. INSULATOR STRUCTURE; W. K. Naylor, Pittsburgh, Pa. App. filed June 16, 1927.

1,725,106. ELECTRIC SWITCH; W. M. Scott, Tredyffrin Township, Chester Co., Pa. App. filed Oct. 15, 1926.

1,725,119. CLAMP FOR SUPPORTING ELECTRIC CONDUCTORS; R. G. Williams, Branford, Conn. App. filed June 13, 1928.

1,725,120. MEANS FOR SUPPORTING AND BONDING MESSENGER CABLES AND CONDUITS FOR ELECTRICAL CONDUCTORS; R. G. Williams, Branford, Conn. App. filed June 27, 1928.

1,725,122. INSULATOR; C. Aalborg, Pittsburgh, Pa. App. filed July 15, 1920.

1,725,123. ELECTRICAL CONDENSER; W. M. Bailey, Lynn, Mass. App. filed May 15, 1928.

1,725,131. RENEWABLE FUSE; J. G. Clemens, Eggertsville, N. Y. App. filed Oct. 1, 1926.

1,725,132. ELECTRIC REGULATION; J. L. Creveling, Oracle, Ariz. App. filed May 14, 1924.

1,725,134. SUPERVISORY CONTROL SYSTEM; J. E. Gardner, Wilkinsburg, Pa. App. filed Sept. 20, 1923.

1,725,137. VOLTAGE-REGULATOR SYSTEM; H. Harz, Berlin-Siemensstadt, Germany. App. filed Nov. 7, 1927.

1,725,157. TRANSLATING DEVICE; S. V. Perry, Wilkinsburgh, Pa. App. filed June 29, 1928.

1,725,161. METER ATTACHMENT; A. R. Rutter, East Pittsburgh, Pa. App. filed June 13, 1924.

1,725,164. RELAY SYSTEM FOR SUPERVISORY CONTROL; J. Slepian, Wilkinsburg, Pa. App. filed March 17, 1924.

1,725,174. ELECTRIC SWITCH; J. S. Baker, Chicago, Ill. App. filed Jan. 29, 1923.

1,725,184. SHOCK-ABSORBER SOCKET; H. H. Frost, Chicago, Ill. App. filed Dec. 8, 1924.

1,725,203. ELECTRIC MOTOR; B. L. McNerney, Minneapolis, Minn. App. filed Nov. 12, 1928.

1,725,208. GRAVITY-TANK FLOAT DEVICE; C. E. Potter, St. Louis, Mo. App. filed Jan. 21, 1928.

1,725,228. HIGH-TENSION SWITCH FRAME; J. B. Trescott, St. Louis County, Mo. App. filed Feb. 18, 1926.

1,725,248. DIRECTION INDICATOR; E. A. Bradbury, Long Beach, and W. B. Holland, Anaheim, Calif. App. filed June 6, 1923.

1,725,255. THERMAL ELEMENT; E. M. Claytor, Forest Hills, Borough, Pa. App. filed May 14, 1927.

1,725,256. CONTROL APPARATUS; E. M. Claytor, Wilkinsburg, Pa. App. filed June 11, 1927.

1,725,260. STORAGE BATTERY; C. J. Dunzweiler, Cleveland, O. App. filed July 2, 1925.

1,725,293. SWITCH BOX OR RECEPTACLE; J. Morgenstern, Cleveland, O. App. filed March 31, 1924.

1,725,296. BURNER-LIGHTING MECHANISM; A. E. Paige, Philadelphia, Pa. App. filed Aug. 31, 1925.

1,725,308. COMBINED CORD REEL; M. H. Shoenberg and L. Schon, San Francisco, Calif. App. filed Sept. 3, 1924.

1,725,357. ULTRAVIOLET-LIGHT THERAPEUTIC APPLIANCE; R. D. Kleeman, Schenectady, N. Y. App. filed Dec. 22, 1926.

1,725,358. WATER SIGNAL SWITCH; K. V. Knapp, Newark, N. J. App. filed May 1, 1926.

1,725,417. ELECTROMAGNETIC SIGNAL (TOY); R. V. Phillips, Brooklyn, N. Y. App. filed March 8, 1927.

1,725,415. THERMOSTATIC-CONTROL MECHANISM FOR DOMESTIC REFRIGERATING SYSTEMS; D. D. Parshall, Watervliet, N. Y. App. filed May 11, 1925.

1,725,441. SAFETY SWITCH AND FUSE BOX; M. J. Caldwell, Eldorado, Kan. App. filed June 13, 1927.

1,725,469. AUTOMATIC STOP; H. E. Millingar and T. T. Pope, Houston, Tex. App. filed March 1, 1926.

1,725,504. RECIPROCATING ELECTRIC HAMMER; A. Bettica, Turin, Italy. App. filed July 6, 1926.

1,725,518. THERMAL RELAY; C. H. Hodgkins, Pittsburgh, Pa. App. filed Feb. 20, 1926.

1,725,522. IGNITION GOVERNING APPARATUS; A. A. Kent, Ardmore, Pa. App. filed June 25, 1921.

1,725,535. ELECTRIC SWITCH; J. Lofgren, Chicago, Ill. App. filed Feb. 14, 1928.

1,725,553. WIRE CLAMP; A. G. White, Morgantown, W. Va. App. filed Jan. 25, 1927.

1,725,555. ELECTROTHERAPEUTIC APPARATUS; M. Wolf, New York, N. Y. App. filed April 22, 1927.

1,725,558. SINGLE-PHASE MOTOR; E. C. Ballman, St. Louis, Mo. App. filed Nov. 3, 1927.

1,725,563. SIGNAL FOR AIRSHIPS; J. P. Buckley and A. E. Nesbitt, Washington, D. C. App. filed Jan. 18, 1928.

1,725,565. HANGER AND ILLUMINATING MEANS FOR MAIL SACKS; O. P. Canaday, Fort Wayne, Ind. App. filed Jan. 14, 1929.

1,725,592. CONTAINER FOR DRY CELLS AND METHOD OF FORMING SAME; C. N. Mertes, Berea, O. App. filed July 2, 1928.

1,725,599. AUTOMATIC PILOT; E. A. Sperry, Jr., Brooklyn, N. Y. App. filed May 6, 1926.

1,725,600. AUTOMATIC PILOT; E. A. Sperry, Jr., Brooklyn, N. Y. App. filed April 26, 1927.

1,725,606. ELECTRICAL SWITCH; E. H. Weatherhead, Cleveland Heights, O. App. filed March 3, 1923.

1,725,633. INTERCONNECTION OF ELECTRICAL SYSTEMS; F. Grieb, Baden, Switzerland. App. filed Jan. 9, 1928.

1,725,635. SIGNAL CONTROLLER; C. A. B. Halvorson, Jr. and H. W. Vickery, Lynn, Mass. App. filed Nov. 26, 1924.

1,725,639. ELECTRIC CONDENSER HAVING INDICATING MEANS COMBINED THEREWITH; H. F. Herman, Chappaqua, N. Y. App. filed Oct. 16, 1925.

1,725,641. ELECTRIC SWITCH; J. D. Hilliard, Schenectady, N. Y. App. filed Oct. 23, 1926.

1,725,662. SYNCHRONOUS INDUCTOR FREQUENCY CHANGER; F. W. Merrill, Fort Wayne, Ind. App. filed Dec. 24, 1927.

1,725,667. INCLOSED DYNAMO-ELECTRIC MACHINE; H. Müller, Waidmannslust, Berlin, Germany. App. filed April 6, 1927.

1,725,683. ELECTRIC WATER HEATER OF THE NONSTORAGE TYPE; W. Stubbs and H. Stubbs, Epping, New South Wales, Australia. App. filed Aug. 28, 1924.

1,725,690. RENEWABLE KNIFE-BLADE AND CARTRIDGE TYPE FUSE; F. L. Young, San Antonio, Tex. App. filed April 10, 1928.

725,691. SYSTEM OF ELECTRICAL DISTRIBUTION; H. A. Affel, Brooklyn, N. Y. App. filed Oct. 24, 1921.

1,725,692. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; A. E. Anderson, Scotia, N. Y. App. filed Aug. 11, 1926.

1,725,695. METER SEAL; H. A. Bakke, Lynn, Mass. App. filed June 27, 1928.

1,725,696. AUTOMATIC CONTROL SYSTEM; H. Bany, Scotia, N. Y. App. filed June 2, 1927.

1,725,697. REGULATING SYSTEM; H. Bany and H. T. Seeley, Yeadon, Pa. App. filed Dec. 24, 1928.

1,725,709. ELECTRICAL APPARATUS; P. H. Geiger, Swissvale, Pa. App. filed Oct. 26, 1923.

New Trade Literature

DRILLS.—Aurora Tool Works, Division of the Oesterlein Machine Company, Cincinnati, Ohio, has just issued a new Aurora drill catalog which illustrates the outstanding features of the Aurora drill. This new catalog not only illustrates the details of but also gives complete specifications of all sizes from 20 in. to 44 in. It also shows the new Oesterlein multiple drill head which may be used with all sizes of Aurora drills. Many special machines can be designed mainly from Aurora drill units. This point is illustrated with a number of special machines built this way. These special machines include combination boring and facing machines, lapping machines with long range for lapping and honing cylinder blocks, high-speed drills for large production jobs of certain types and special drills with extra large cooling tanks, etc.

FLOW METERS. — The Brown Instrument Company, Philadelphia, Pa., has recently received from its printers the second edition of the Brown flow meter catalog. This new catalog, No. 21, is a 90-page book containing a very complete presentation of the general theory, use, design and practical application of the flow meter, with a detailed and well-illustrated description of the principle, construction and features of the Brown electric flow meter. In addition it shows a number of interesting and useful instruments, the design of which are an adaptation of the Brown electric flow meter operating principle and construction, but which are applied to purposes other than flow measurement.

REGULATORS. — Northern Equipment Company, Erie, Pa., has issued a new catalog containing a complete description of Copes feed water regulators for both low and high pressure service with many interesting photographs of actual installations. The Copes type RG combined feed-flow-water-pressure regulator is, for the first time, included in a Copes catalog, as are the type SS differential water-pressure regulating valve, the Copes type DS pump governor, the Copes control valve, the Copes condensate drainage control and the Copes valve movement indicator. All of these products have widespread applications in the power plants of industrials and central stations.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Shanghai, China (No. 40556), of electric storage batteries.

An agency and purchase are desired in Amoy, China (No. 40598), for generators and motors, electric wire and transformers.

An agency is sought in Wellington, New Zealand (No. 40640), for household electrical appliances.

An agency is desired in Amsterdam, Netherlands (No. 40599), for electric motors.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Municipal Plant Capacity a Twentieth of the Total

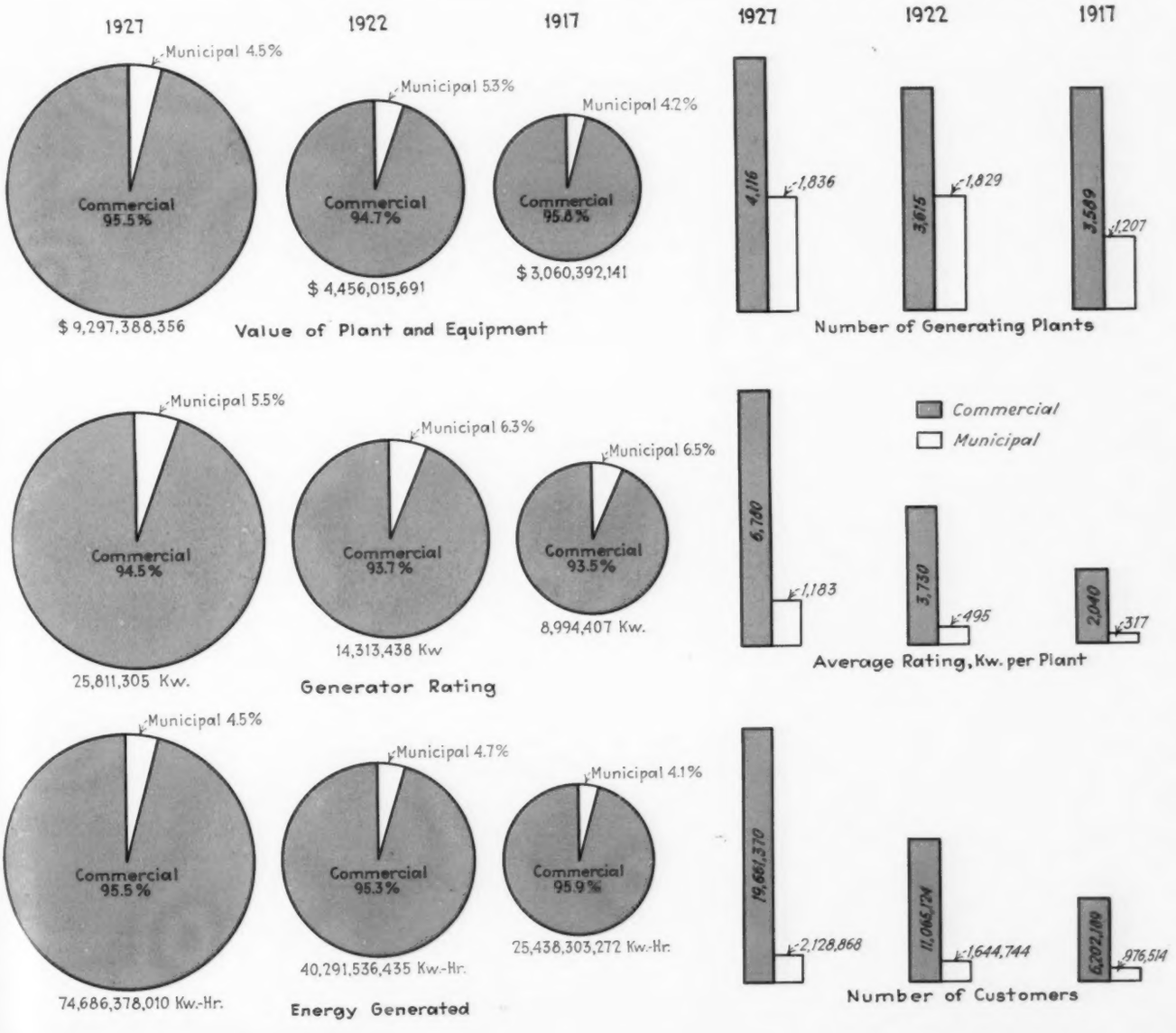
PRIVATE enterprise accounts for about 95 per cent of the electric light and power industry in the United States, municipal undertakings for the remainder. In plant capacity the ratio is a little more favorable to the municipal systems; in value and in energy generated it is smaller. This is to be expected, because of the large investment of private capital in transmission lines, in the more costly type of steam and hydraulic plants and in expensive urban distribution systems additionally to those plant investments common to both groups.

The relatively smaller output of the municipal plants in proportion to machine rating follows almost inevitably from the nature of their loads and the lack of diversity through interconnection.

Both groups of properties have shown marked growth since 1917, but, during the last five years at least, the commercial systems have exceeded the municipal in their relative increase.

There are over a third as many municipal plants as commercial, but on the average they are only a sixth as large. In both groups the number has been steadily decreasing, the size increasing. Each, in its way, shows the effect of eliminating small generating stations.

While a tenth of the customers in 1927—an eighth in 1922—were on municipal circuits, the plant and output per customer of the commercial establishments is much the larger, mainly because of the numerous power loads, including many non-generating municipal systems, each counting as only one customer. (For further data see ELECTRICAL WORLD, Aug. 31, 1929, page 427.)



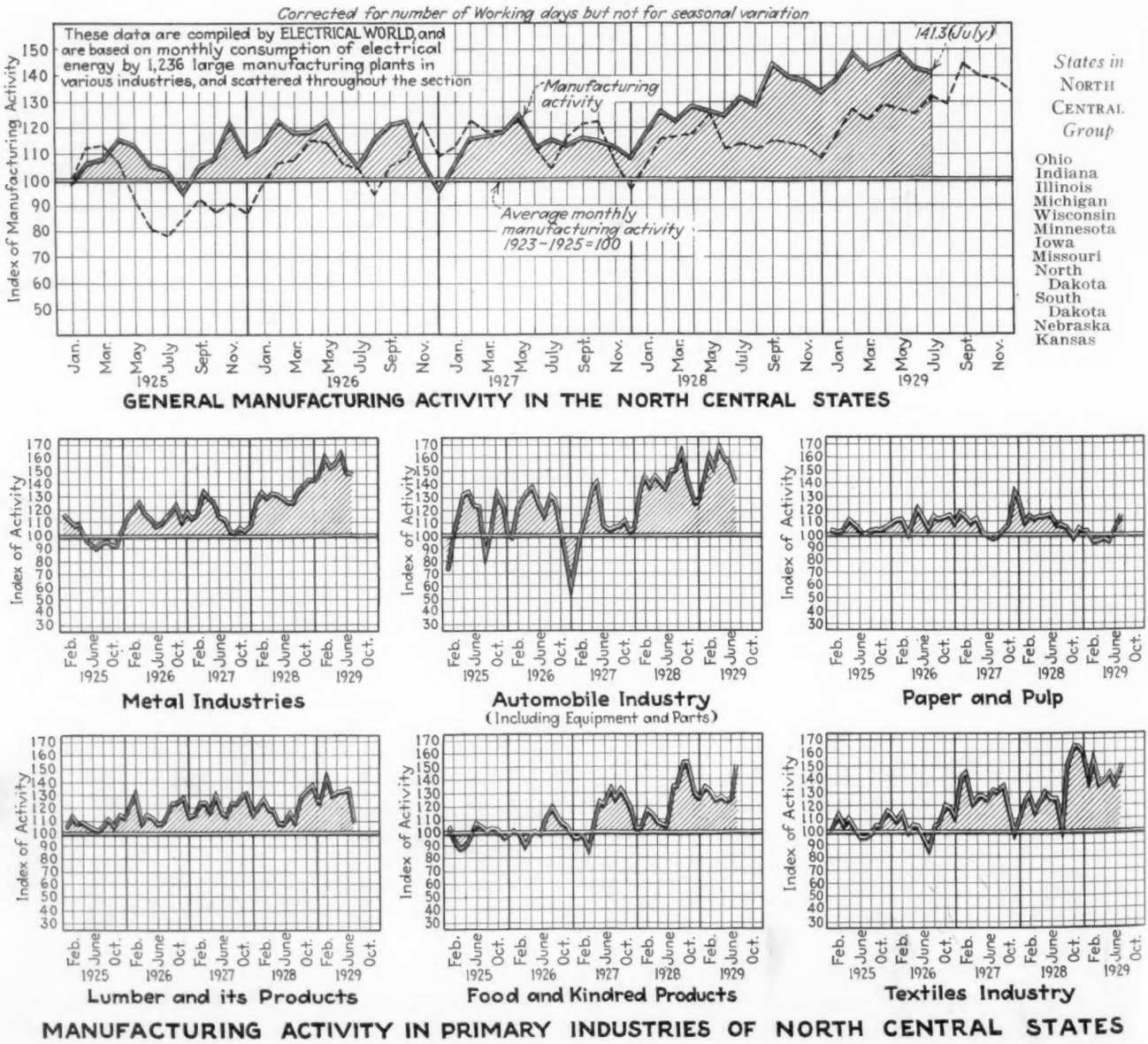
High Production Maintained in North Central States

REPORTS received on the consumption of electrical energy from manufacturing plants located in the North Central States indicate that July witnessed a slight drop in rate of productive operations as compared with June. The July rate of activity, after corrections are made for number of working days, was 0.5 per cent under June, but was on a plane 8 per cent above July last year.

Seven of the section's most important manufacturing groups—textiles, paper and pulp, iron and steel, ferrous and non-ferrous metal-working plants, food products, rubber products, and stone, clay and glass—all reported a July rate of operations above that witnessed during July last year. On the other hand, chemicals, lumber products, leather products and the automobile industry all report July activities under those of July last year. The drop in operations in the automobile manufacturing plants was rather significant in that this is the first time that the rate of operations has dropped under the same month of the year previous since May, 1928. These plants appear to have reached their peak of activity in April.

Indexes of Productive Activity in the North Central States

All Figures Adjusted for Number of Working Days

	July, 1929	June, 1929	July, 1928	Average for First Seven Months, 1929	Average for First Seven Months, 1928
All industries	141.3	142.0	130.8	144.1	125.5
Chemical and allied products	137.4	131.5	138.3	140.4	123.6
Textiles	149.7	133.8	126.3	142.5	125.2
Lumber and its products	106.4	133.2	119.4	128.9	117.4
Paper and pulp	114.8	109.4	104.5	100.7	110.6
Automobile, including the manufacture of parts	141.2	155.5	151.3	155.5	142.6
Metals group	148.2	148.8	124.8	153.9	129.8
Rolling mills and steel plants	144.0	154.2	128.2	156.7	130.1
Metal-working plants	151.2	143.8	121.4	151.0	129.5
Food and kindred products	150.2	125.0	136.2	131.2	112.9
Leather and its products	100.5	119.1	101.2	102.3	106.4
Rubber and its products	152.6	168.0	142.0	165.6	136.5
Stone, clay and glass	141.7	147.8	115.6	133.1	106.4

ELECTRICAL WORLD *Barometer of Industrial Activity in the North Central States*